Vol. 5 MARCH, 1922 No. 3

Journal
of the
American Ceramic Society
with
Ceramic Abstracts

A Monthly Journal devoted to the Arts and Sciences Related to the Silicate Industries

COMMITTEE ON PUBLICATIONS

EDWARD W. WASHBURN, Editor
Ceramics Bldg., Urbana, Ill.

R. E. Mussun, Chairman,
General Ceramics Co., Metuchen, N. J.

A. V. Bleininger,
Homer-Laughlin China Co., Newell, W. Va.

H. F. Staley
Mintal and Thermia Corporation,
120 Broadway, New York City

E. W. Tillotson,
Mellon Institute, Pittsburgh, Pa.

Le Roy W. Allison, Manager Advertising
170 Roseville Ave., Newark, N. J.

CONTENTS

Page

Editorials:
The Second Conference of the International Union of Pure and Applied Chemistry 131
Abstracts from the Journal of the Japanese Ceramic Society 135

Original Papers and Discussions:
A Device for Testing the Resistance of China to Chipping—Schramm 138
The Development of Ceramic Work at the University of North Dakota—Cable 140
The Handling, Storing and Setting of Glass Pots—Clark and Forsyth 146
Suggested New Methods in the Preparation of Dust-pressed Bodies—Spurrier 151
A Small Glass Tank—Bellamy 157
Correction 160

Ceramic Abstracts 55

Book Reviews 93

Published Monthly by the
AMERICAN CERAMIC SOCIETY
Publication Office: 211 Church St., Easton, Pa.

Eight Dollars per Year. (Foreign postage additional.) *Single Numbers, Seventy-five Cents*

Entered as second-class matter, July 13, 1918, at the Post Office at Easton, Pa., under the Act of March 3, 1879.

Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized August 16, 1918

Copyright 1922, American Ceramic Society

THE

Roessler & Hasslacher Chemical Co.

FOUNDED 1887 NEW YORK

BRANCH OFFICES
AND
REPRESENTATIVES

CHICAGO

BOSTON

NEW ORLEANS

CLEVELAND

PHILADELPHIA

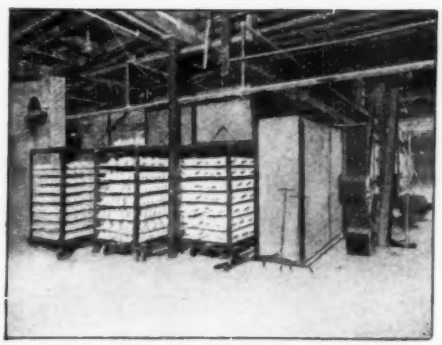
TRENTON

KANSAS CITY

PITTSBURG

SAN FRANCISCO

Cutting Costs by Uniform Drying



Tunnel Truck Dryer for Insulators

The time required to dry ceramic ware is greatly reduced when the moisture is withdrawn from all surfaces, evenly and uniformly. Besides cutting down the drying time, steam and power consumption is consequently lowered.

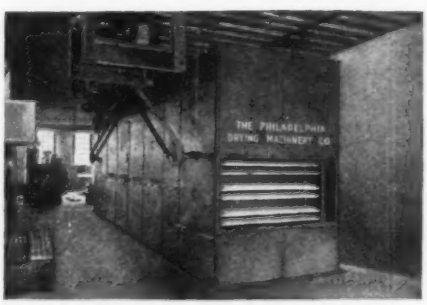
Uniformity in the results obtained is the underlying secret of the success of

"HURRICANE" DRYERS

All sizes and shapes of ware are being handled, including heavy electrical insulators, saggers, general ware, enameled ware, spark plug cores, enameled table tops, etc., with equally excellent results on all.

Are you obtaining quick uniform drying, or are you wasting steam, time and power?

"Hurricane" Dryers will remedy the losses



Automatic Dryer for Spark Plug Blanks

Automatic Stove Rooms and Mangles
Stillage and Truck Dryers

The Philadelphia Drying Machinery Co.

Main Office and Works
3351 Stokley St.

Philadelphia, Pa.

Boston Agency
53 State St.

HF&G

CLAY

FOR

Pottery, Glass, Enamels

For BALL SAGGER WAD Potters

Mined By
The H. C. Spinks Clay Co.

SOLD BY

THE HARSHAW FULLER AND GOODWIN CO.

Cleveland
New York Philadelphia Chicago

JOURNAL
OF THE
AMERICAN CERAMIC SOCIETY

A monthly Journal devoted to the arts and sciences related to the silicate industries.

Editor: E. W. WASHBURN; **Associate Editors:** L. E. BARRINGER, A. V. BLEININGER, R. L. CLARE, E. P. POSTE, H. RIES, F. H. RHEAD, R. B. SOSMAN, R. T. STULL, E. W. TILLOTSON

Vol. 5 **March, 1922** **No. 3**

EDITORIALS

THE SECOND CONFERENCE OF THE INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

The second conference of the International Union of Pure and Applied Chemistry was held in Brussels on June 27–30, 1921, and a copy of the proceedings of this meeting has just been received. It will be recalled that the American Ceramic Society through its membership in the Division of Chemistry and Chemical Technology of the National Research Council was a party to the creation of the International Union and was represented by a delegate at the meeting in London in 1919, at which the Union was organized. The American delegates are chosen by the Division of Chemistry and Chemical Technology of the National Research Council but each of the constituent societies has the privilege of nominating delegates and alternates. This privilege has not been utilized by our Society since the London meeting and in view of the approaching third conference of the Union which is called to meet in Lyons, France, in June, 1922, some action should be taken to make possible the representation of the Society at this conference especially as some matters of ceramic interest are to come up for consideration.

The principal matter of special interest to the Society is a pro-

posal made in a report presented to the Brussels meeting of the Union in the name of the national Belgian committee. A free translation of this report is presented below.

The point especially emphasized in this report is a vital one. Satisfactory and scientifically reliable methods for the testing of materials can not be developed merely from the discussions of committees and the survey of results of experience. Every problem of this character should receive a critical study in a laboratory properly equipped and staffed for such work. The final selection of a testing method to be adopted as a standard is a matter to be mutually agreed upon by competent engineers and chemists representing the industrial interests involved but the critical examination of proposed methods, the study of their errors and limitations and the development of improvements in accuracy, convenience and rapidity, is a problem for the trained chemist and physicist working in a properly equipped laboratory and with all the advice and assistance which the technical men in the industries are able to furnish.

With regard to a practical plan for international coöperation in this field the proposal of the Belgian committee raises several important questions. It is not probable that nations which themselves possess laboratories established for work of this character would care to make any considerable financial contribution toward the establishment and maintenance of an international testing laboratory but nations which do not have such facilities might well coöperate in this way. One of the prime functions of our own Bureau of Standards is the study of problems of this character and we could doubtless contribute most effectively to an international program in this field by coöperative arrangements between the Bureau of Standards and other similar laboratories now in existence or which may in the future be established in the other countries of the world. Such international coöperation in connection with electrical standards has been in existence for a number of years.

With regard to the specific recommendations of Messieurs Lecrenier and Huybrechts only one other adverse criticism seems to us to be called for and that is with respect to the directive machinery which they propose for such a laboratory. Their plan

provides for a representative committee of chemists who would direct the work of the laboratory. Such a method of control seems to us inadvisable. An advisory committee of chemists and engineers representing all the interests involved is both necessary and desirable but the directive authority should be vested in the man chosen as the director of the laboratory, and while it is to be expected that he will work in close harmony and constant contact with his advisory committee he should have a large measure of authority in determining the policies and methods of work of the laboratory.

In acting upon this report the Union provided for the nomination of a permanent committee with at least three members from each country to be designated by the National Research Council (or its equivalent). In each instance, of the three members thus chosen, one is to be an expert on solid fuels, one on liquid and gaseous fuels and the third on ceramics. The American members of this committee have not yet been selected and the Society should study the questions involved and be prepared to make suggestions concerning American representation and concerning all the questions involved in the proposal.

The Establishment of National and International Laboratories for Ceramic and Fuel Investigations

A REPORT PRESENTED TO THE SECOND CONFERENCE OF THE INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY IN THE NAME OF THE NATIONAL BELGIAN COMMITTEE

Chemists seem to be in accord with respect to the inestimable advantages of approved methods for the analysis of minerals and industrial products. In a report presented to the First International Chemical Conference held in Rome in 1921, M. Nicolardot summarized the results which have thus far been obtained in this direction. He demonstrated that the labors of commissions which have at various times been created with this end in view have yielded no practical results. He attributes this failure to lack of financial resources, to the absence of a central laboratory, and to the lack of authority on the part of the commissions to compel the adoption of their recommendations.

We should, however, not lose sight of the great scientific value of experimental results which have been brought together, compared and discussed and the conclusions which have thus been reached. Unfortunately these are known to but few chemists and the pains which certain of them have taken to make these results and conclusions more generally known have had no appreciable success.

Such work ought to be very productive and in our opinion it should be continued under a different type of organization, free from the defects of past attempts. The new organization should provide especially for the establishment of national and international laboratories supported by subsidies from the State and the industries and these laboratories should be directed by a representative committee of chemists.

In order to insure a maximum output such a laboratory should, at least at the start, concentrate its efforts upon a comparatively small number of projects. We believe that, because of their great industrial importance, the first problems to be attacked should be those relating to fuels and to ceramic raw materials and products, especially refractory materials. The study should cover products including a wide range of compositions and the various testing methods should be compared from the point of view of accuracy and rapidity.

One of the first consequences of such a study of testing methods would be the disappearance, in a large measure, of existing disagreements and it would also carry with it a consequent economy for the industries, since the latter would then be in a position to carry out in their own laboratories many routine tests for which at present they are dependent upon outside laboratories.

If one wished to sketch briefly the procedure for such an investigation one would include the sampling, the preparation of the test piece, and the analysis proper. The procedures elaborated should be described in detail and the reason for each step explained and scientifically justified. The results obtained by different procedures should be compared and should, of course, be stated in uniform terms. The additional tests, of a physico-chemical character, such as mechanical analysis, pyrometric tests, the resistance of refractories to attack by gases and fluxes, etc., should be carried out for the purpose of ascertaining the relation between the physical properties of such materials and their chemical and mineralogical composition. The program which we have sketched above is not intended to restrict the field of investigation but merely to emphasize some of the more important problems.

In the case of fuels it would be advisable, in our opinion, to cover methods of sampling, preparation of the sample for analysis, the chemical analysis proper, the determination of the calorific power, the determination of such physical properties as density, viscosity, ignition point, etc. (in the case of liquid fuels), methods of using the fuel, its coking behavior, the agglutinating power of oils, the conservation of coal, the testing of illuminating gas, the manufacture of coke, its by-products, briquetting, pulverized fuels, and finally the combustion apparatus.

After these systematic investigations on refractories and fuels, other problems should be taken up in accordance with a well-thought-out program. The results of the work should be published and widely distributed so that they may be read by everyone interested. The methods of analysis and testing would not be compulsory upon chemists but we are convinced that such procedures, established with scientific disinterestedness and as a result of the collaboration of all competent chemists, would acquire such a prestige as to

insure their general adoption. They would, of course, always be subject to future modifications and would be regarded not as a final solution of the analytical problems but as a point of departure for future progress.

(*Signed*) A. LECRENIER
M. HUYBRECHTS

ABSTRACTS FROM THE JOURNAL OF THE JAPANESE CERAMIC SOCIETY

The members of the Society will be glad to learn that through an arrangement with Professor Seiji Kondo, Director of the Ceramic Department of the Tokio Higher Technical School, Asakusa, Tokio, Japan, all papers published in the Journal of the Japanese Ceramic Society will be regularly abstracted in English and the abstracts will be published in *Ceramic Abstracts*.

ORIGINAL PAPERS AND DISCUSSIONS

A DEVICE FOR TESTING THE RESISTANCE OF CHINA TO CHIPPING[1]

By Edward Schramm

ABSTRACT

The device (shown in the figure) measures the blow required to chip the edge. Results are reproducible to within about 10%, this variation being due to lack of uniformity in the pieces tested. Vitrified china is more resistant to chipping than is semi-porcelain or European true porcelain.

In a paper[2] by H. F. Staley and J. S. Hromatko the modes of failure of tableware in service are discussed at length and a pendulum impact test designed to approximate service conditions is described. The work was confined to heavy hotel china plates of various makes. It was found that the design of the plates was an important factor in their resistance to impact. All the data given refer to the true impact test, *i. e.*, to the determination of the energy of the blow required to produce total failure; however, in the summary it is pointed out that one characteristic difference between vitrified and semi-porcelain ware lies in the greater resistance of the former to chipping under light blows. No attempt was made to estimate resistance to chipping quantitatively. Now for certain classes of service, notably thin dinner ware, this property is at least equal in importance to the ability to withstand heavy blows without fracture.

Accordingly an apparatus of the pendulum type was constructed especially adapted to chipping tests. The photograph will make the principle clear. The stand is built of $2^1/_2$-inch seasoned oak. It consists of a base piece with a short upright at one end carrying

[1] Received January 18, 1922.

[2] *This Jour.*, **2**, 227 (1919).

a shelf on a pair of heavy hinges. The shelf can be adjusted to any desired angle by turning the supporting screw which works into a thread in the base. By this means the leaf of the plate can readily be brought into a horizontal position regardless of its angle. The backing for the plate is provided by a block, cut into a V on one side and faced with hardened steel plates. The block is clamped to the shelf by means of a threaded bolt which travels in a slot in the shelf; this block is guided by two small dogs sliding

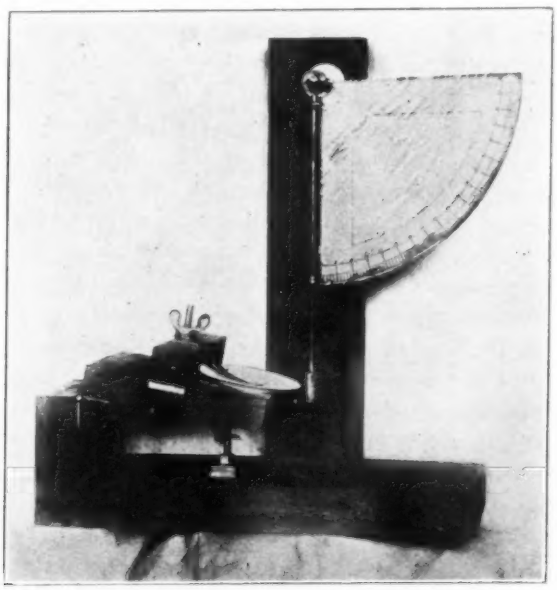


FIG. 1.

on the sides of the shelf in such a manner that the point of the V moves in the plane of the pendulum. The block is clamped in the position appropriate for the particular size of plate being tested. It provides a backing for the plate and also serves to center the latter so that the pendulum always strikes at 90°. The pendulum is rigid and is supported by a bronze collar rotating on a steel shaft which is clamped to a heavy post. The post also carries the arc of 1 foot radius graduated in degrees. The pendulum collar is made $2^1/_2$ inches long to give a true guide, but is hol-

lowed out in the center to reduce the bearing surface. A brass rod four inches long screws into the middle of the collar and over this slides a $^3/_8$-inch brass tube split at the top and provided with a clamping nut to allow adjustment in length. The bob (which may be changed to suit conditions) is a piece of $1^1/_4$-inch steel rod, case hardened and threaded to fit the brass tube. The position of the pendulum is read by means of a small indicator attached to the tube.

In use the plate to be tested is placed on the shelf, being held in place by a steel spring, and the shelf raised or lowered to bring the top of the leaf horizontal. The backing block is adjusted to bring the edge of the plate in contact with the bob in its zero position, and α, the angle of swing at which the first chipping occurs, is noted. Trials are made at ten points around the circumference of the plate and the average value taken. From the angle α the corresponding energy of the blow can be readily computed; or if the length and mass of the pendulum are fixed we may take as the resistance to chipping, $1\text{-}\cos\alpha$.

Judging from experience to date we may state that the chief difficulty in the way of securing consistent results lies in lack of uniformity of the pieces tested rather than in the apparatus or method. Variations in shape and thickness have a marked effect, and if these can not be controlled we must depend on the averages of a large mass of data. This holds true in almost equal degree for the true impact test employed by Staley and Hromatko. The latter expressed their results in terms of the energy per unit thickness on the assumption that strength is directly proportional to thickness but there is no evidence in support of this assumption. Before comparisons can be made of pieces of different weights or shapes the effect of these variations will have to be worked out. In studying the comparative behavior of different bodies we used the expedient of numbering the moulds and making plates of the several bodies on the same mould and under otherwise identical conditions.

Some typical results are given in the following table showing in each instance the mean of ten measurements, the average and the maximum deviations from the mean and the corresponding value for $1\text{-}\cos\alpha$.

TABLE I

Body	Mean α (degrees of arc)	Av. dev.	Max. dev.	1-cos α
Body A, Mould N. Edge of leaf 0.09 inch	15.0	2.3	6.0	0.034_2
Body B, Mould N	21.0	1.6	3.0	0.066_4
Body A, Mould P	18.2	3.4	6.0	0.050_0
Body B, Mould P	21.3	2.9	6.0	0.068_9
French porcelain, same thickness as above	11.1	0.9	4.0	0.0187_1
English bone china 25% thicker than above	16.1	1.6	4.0	0.039_2

From our work to date the indications are that in resistance to chipping vitrified china is not only superior to semi-porcelain as shown by Staley and Hromatko, but is also better than the European type of true porcelain.

It will be obvious that the apparatus as described will serve equally well for true impact tests if a ball is substituted for the cylindrical bob and an auxiliary vertical plate support is provided.

ONONDAGA POTTERY CO.,
SYRACUSE, NEW YORK

THE DEVELOPMENT OF CERAMIC WORK AT THE UNIVERSITY OF NORTH DAKOTA[1]

By Margaret Kelly Cable

ABSTRACT

The development of the Ceramics Department of the University of North Dakota; correlation of research in chemical and experimental laboratories and cultural value of the work; inexhaustible supplies of the state being utilized.

The ceramic work at the University of North Dakota had its conception in the research work of the School of Mines on the high grade clays of the State.

There are many different types of clays in North Dakota undeveloped, yet suited to the manufacture of a great variety of ceramic products from common brick to those higher grades of pottery which are the most exacting in their chemical and physical requirements.

As North Dakota is relatively a young State there has not been time to thoroughly investigate and develop many of its resources. This is particularly true of its great deposits of lignite and its varied and valuable clays, some of the finest of which are found in close proximity to extensive deposits of lignite capable of supplying abundant and cheap fuel, so important in the development and economies of a ceramic industry.

The preliminary investigations of the School of Mines made so evident the high quality of many of these clays that it seemed desirable to provide facilities for their more detailed technical and practical study. As a result the Ceramic Department of the School of Mines was established.

Although its primary purpose was to afford better research facilities in ceramics, it soon became evident that this, both for technical and economic reasons could be coupled advantageously with instructional work, utilizing thereby the equipment, the technical

[1] Received December 26, 1921.

FIG. 1.—Slip room, Ceramic Department, School of Mines, University of North Dakota.

FIG. 2.—Art pottery made at the School of Mines, University of North Dakota.

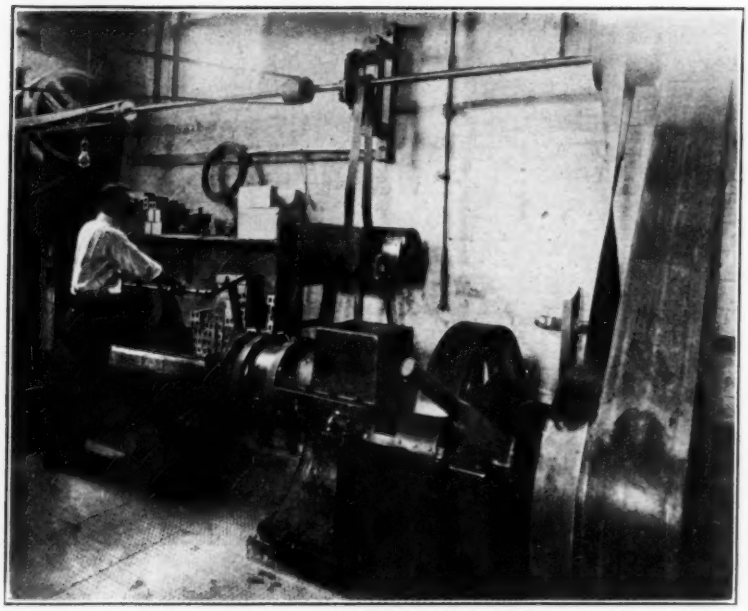


FIG. 3.—Brick machinery, Ceramic Department, School of Mines, University of North Dakota.

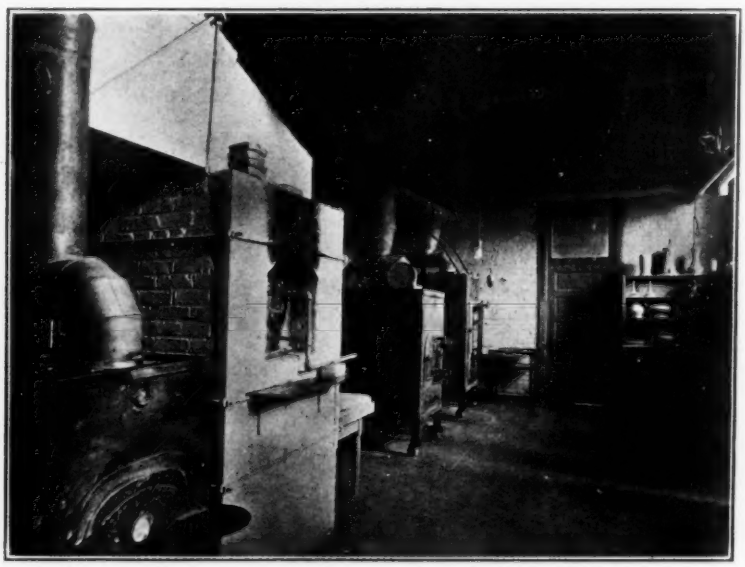


FIG. 4.—Kiln room, Ceramic Department, School of Mines, University of North Dakota.

FIG. 5.—Pottery laboratory, Ceramic Department, School of Mines, University of North Dakota.

FIG. 6.—Stoneware, tile, etc., made at the School of Mines, University of North Dakota.

force and later, the contributions of advanced students in securing a larger volume of research work, while at the same time affording an opportunity for instruction and training to young people interested in the great field of ceramic technology.

From time to time the courses of instruction originally outlined have been extended and other courses added although they have not as yet been developed into a curriculum leading to a ceramic degree. On the other hand students in mining and industrial engineering are given an opportunity to take some of these technical courses as ceramic electives. Other courses are open as electives to students in the College of Liberal Arts and in Teachers' College.

As the pottery industry is one of the best illustrations of the combination of industry, science and art, its study is therefore very worthy of a place in a university curriculum. For this reason we have emphasized somewhat the pottery phase of the industry and have aimed to keep constantly before the students its scientific and cultural value as well as its practical value. We have also felt that if we could prove, in our research work with our higher grade clays, their fitness for the more exacting and more beautiful types of products we could, with comparative ease, work downward in our research into those types of clays fitted for the more common products. This plan has proved very successful. Our students have taken a deep interest in the work because they are dealing with actual problems concerning our undeveloped resources, and because they are lead to see the direct application of science to this study and the really artistic and beautiful products which may be created by the application of technical methods combined with careful design and manipulation.

The result has been a much larger demand for the work than we have been able to accommodate. We have reached an enrollment in these various courses of over sixty, with a waiting list of nearly as many more.

We have endeavored to put our work on a scientific, technical and practical basis from the start using the methods of investigation and operation which would be employed in the most up-to-date industrial plants. Our chemical and experimental labora-

tories have, therefore, been well equipped for clay testing, and the clay-working laboratories have been provided with standard types of machinery for actual production by the same methods as employed in the various lines of ceramic industries. We have endeavored to make our clay-working laboratories what might be called small working plants and in so doing we have developed on the one side a small brick and tile unit for the practical working of clays adapted to construction material and on the other side a pottery unit. In this way all of the essential operations can be carried on in either line of work by standard methods and by standard equipment.

The character of the work has steadily improved until the products, especially in our classes in practical pottery, are of excellent quality and of such a character as to prove beyond a doubt that there are many deposits of exceptional clays in North Dakota well fitted for the production of high grade stoneware, earthenware, art pottery, etc. In addition to our instructional work we are accumulating a large amount of technical and practical data on our undeveloped clays.

When we consider the quality and the proximity of some of these deposits to inexhaustible supplies of fuel there seems to be no reason why in the near future North Dakota should not be ranked among the important states in the ceramic industry.

University of North Dakota
Grand Forks, N. Dak.

THE HANDLING, STORING AND SETTING OF GLASS POTS[1]

By Wm. M. Clark and J. H. Forsyth

ABSTRACT

"A glass pot is a wonderful piece of engineering:" It is an expensive article and deserves the most careful treatment. The precautions indicated are; careful packing for shipment in *rain proof* box cars, well padded pot carriages equipped with the spring suspensions, storage in a *warm, dry* room, careful preparation of furnace bench to insure an *even distribution of load* on the bottom of the pot and to make certain that the pot is *level*, or tilted slightly forward. Unnecessary jolts often result in damage which only becomes apparent when the pot is heated up.

Introduction—Preliminary Precautions

The point that should always be held uppermost in mind concerning a glass melting pot is that it is really a marvelous piece of engineering. A mass of clay weighing around one and one-half tons, moulded, shaped and carefully dried, which will stand the rough treatment necessitated in shipment is remarkable. This body of clay has been nursed and petted from the laying of the bottom to the state of final drying in the pot room and from its very nature is fragile, and its mechanical strength, weak.

The fact that the pot must be shipped by box car, is an unfortunate necessity but all possible means should be used to protect this mass of unburned clay both in the car and up to final setting in the furnace.

Shipment

The presumption is that a water tight box car has been selected for shipment and it may be well to have water from a hose flow over the roof of the car to fully demonstrate that it is rain proof.

The pots should be set on dry packing hay and well braced so that they can not shift position or be jarred during transit.

[1] Received November 14, 1921.

Unloading and Storage

When the car is received in good order it is well to have a yoke or block and tackle arrangement to raise the bottom of the pots up to the level of the pot carriage. Carriages should be well padded with canvas strips or rubber hose, and it has been found advantageous to have spring suspensions and roller bearings to avoid jolts when crossing thresholds, rough flooring and other irregular surfaces. All straining, jolting and jarring should be eliminated whenever possible.

Possibly the careless maner in which pots are sometimes handled is due to the fact that the result of jars or strains is ofttimes not apparent while handling the pot but shows up at later stages, for instance during the heating-up period in the pot arch. In such cases cracks due to the release of strains set up in handling can be very easily accounted for by a number of different causes and the real origin remain a mystery.

Pots should be stored in a dry place selected for this sole purpose, such as beneath the furnace room. This space should be fenced off with wire netting and provided with a door and lock so that only the furnace man has access to the room. The bottoms should be raised on blocks to give opportunity for air to circulate beneath. Naturally the oldest pots should be used first and the storage room should be so arranged that they will be withdrawn in natural sequence.

A card record giving the life history of each pot from the time it is received until it is removed from the furnace is advisable so that the individual performance of each pot is known, its inferior or superior qualities may be traced and the results transferred to a summary sheet.

A typical card may be arranged as follows:

POT RECORD Glass Co. DATE

Furnace No.———————Arch No.———————

Pot Broken————Maker————————No.————

Remarks———— ————————

How Broken, etc.

Size, etc.

Pot Set— — —Maker————————No.————

Summary Pot Record——————————Glass Co. Arch No.——

Maker's Name and No.	Set	Broke	Life	Remarks	Melts.
/	/	/	/	//	/ / / / /
				Total——	

Etc.

The majority of plants have only hand drawn pot carriages. If the volume of business warrants, however, it is advisable to adopt power driven carriages, either electric trucks, or, for furnace room work, steam driven pot handling machines.

A successful departure from usual practice followed at one plant was to construct a pot room alongside of a checker chamber by merely enclosing the space for a few bays with a brick or tile wall. The waste radiated heat from the checker chamber kept this room warm and pots were transferred here from the storage room preliminary to introduction in the pot arch, so that they were evenly and well dried out and somewhat heated when ready for the pot arch.

Contrast this care with what is sometimes found around glass works: pots stored in cold warehouses, or any odd space in the plant, sometimes near broken windows where snow and rain beat in and other exposure to moisture is present.

A glass pot is a wonderful piece of engineering skill when we consider the great weight, thick walls, long time required to manufacture and severe treatment to which it is to be subjected. There is no other appliance or tool worth one hundred dollars around a glass house which is not given better care or more closely watched lest it be damaged, and yet the pots are the main-springs of the business. Considering the loss of production and the arduous labor resulting from the loss of pots, is there any reason why all precautions should not be taken to prolong the life of the pot? Consequently elimination of every cause of jolts, jars and rough handling is most desirable.

Pot Setting

The setting of pots is an operation carried out by a well trained crew in fifteen or twenty minutes where a skillful foreman is in

charge and a proper subdivision of labor is maintained so that each man knows his specific duties. It is one of the most spectacular features in connection with glass house operation.

It is well to remove the regular sheet metal doors just before pot setting, and to hang on the hinges an old set of doors which have been warped and scaled by exposure to the high temperatures and which are used only at the time of pot setting. The jack bricks composing the breast wall are torn out and piled conveniently at one side of the arch. Lastly the breast wall bricks are loosened by leverage, a carriage is inserted under them and they are wheeled to one side of the opening. The sheet metal doors serve as shadow pans in retaining heat within the furnace and thus protect the operators. Chain screens or wire gauze screens may be used advantageously for heat protection, comfort, and retention of heat within the furnace.

When the breast wall is clear the old pot is attacked. If glass has leaked out through a crack and frozen the pot to the bench considerable exertion may be required to remove this glass with rakes, shovels and hoes. Finally a pry is applied beneath the mouth of the pot until it can be raised and the prongs of the pot carriage forced beneath the bottom. Then the long handle of the pot carriage serves as a lever and the wheels as a fulcrum and the pot is lifted and carted off to the dump.

Meanwhile the other men start cleaning the bench and removing all traces of any glass that has leaked out. When they have an even clay bottom a cushion of clean sand is thrown over the bench and it is ready to receive the new pot. This is brought from the pot arch on the pot carriage and placed in approximate position and then gently lowered into place and the pot carriage withdrawn.

Care must be exercised that the pot is level. This is usually accomplished by the foreman taking special pains when the bench is cleaned to see that sufficient sand is used so that when the pot has settled into place only a small amount, if any, additional filling will be necessary.

The arduous labor of raking, hoeing, and spreading of sand in the above operations is greatly lessened if the leverage principle is used to full extent. This may be done by having extra long

handled tools and employing a "Lazy Bones" as the fulcrum point.

Carelessness in cleaning the bench will result in the bench gradually becoming so high that the pot will not enter the arch of the furnace while still on the carriage. This means that the pot must be unloaded in the arch opening and shoved on the bed of sand into the furnace. Bunting the pot just under the hood with the pot carriage is the usual method of accomplishing this end. Although the pot at this point has been burned and possesses considerable mechanical strength vibrations set up by such rough treatment ought certainly to be discouraged.

The method practiced by one old hand at setting pots is to have the bench thoroughly cleaned and enough sand placed at the back of the pot so that the pot can be settled down to the proper level. The front of the pot can be easily barred up and sand thrown under to raise it but it is next to impossible to do this at the back. When the pots are not completely worked out it is a good plan to tilt the pot slightly towards the mouth thus relieving the back, or the weakest part of the pot when in the furnace, of the added pressure of the glass.

After the pot is properly leveled the breast wall bricks are wheeled into position on the block carriage. The jack bricks are lifted by means of forked rods into their proper positions so that a neat fitting breast wall results and the few interstices between the blocks are mudded up with clay in order to make a gas tight closure around the pot. Accurate placing of these jack brick is easily accomplished by using a bar as fulcrum for the jack brick fork. The bar can be held by two men or a stand for the same purpose may be employed.

It will be seen that only the very greatest pains can be advocated in all handling of pots if the best service is desired. Plants pursuing such care may be exceptional, but records from such plants prove that the results attained will justify the precautions taken.

Glass Technology Dept.
National Lamp Works of General Electric Co
Nela Park, Cleveland, Ohio

SUGGESTED NEW METHODS IN THE PREPARATION OF DUST-PRESSED BODIES[1]

By H. Spurrier

ABSTRACT

Milling.—A continuous pebble mill of the self-feeding type is recommended. Segregation due to difference in density is not to be feared.

Drying.—Instead of drying completely, wetting down, tempering, aging and grinding the author recommends drying the press cake only down to a water content of 16%, followed immediately by disintegrating and pressing. The pressed ware produced by this shortened procedure is very satisfactory.

A Combined Disintegrator and Dryer.—The author suggests the application of a hot blast to the clay as it leaves the mill for the disintegrator thus drying and disintegrating it in one operation. This suggestion has not, however, been tried out.

It is frequently of mutual advantage for a worker to be brought suddenly into contact with new phases of industry, because during the necessary learning process old activities will be viewed from new angles, and hoary trade practices, which have the stability of the pyramids, will be investigated apart from the blinding glare of universal assent, that damning attitude of mind which gave rise to the "As it was in the beginning, is now, and ever shall be," spirit which so successfully shackles human progress.

The writer had the good fortune, about a year ago, to be the worker end of the couplet above alluded to. In the preparation of clay for dust-press operations it soon became evident that, in order to secure constancy of finished dimensions, it was necessary to control the moisture content of the dust as this was found to be the greatest factor in controlling shrinkage. It is, however, quite difficult to do this, under current procedure where finished sizes of large pieces must be controlled within narrow limits, in order to avoid rejections.

On reflection it became evident that there were other points in current practice that might advantageously be revised. For instance the drying of clay, always inimical to the best working

[1] Received January 30, 1922.

properties of plastic bodies might be so controlled as to avoid the usual injury to the essential and delicate hydrogel constituent. The nearly complete drying of clay renders re-handling, wetting down, and tempering necessary, and these operations, as usually carried out, are commonly erratic, on account of insufficient time being allowed, and the varying water content of the prepared dust. The following plan was developed so that better dust could be prepared more rapidly at less expense and with a more accurately controlled moisture—body ratio.

In preparing clay for working in the plastic condition the pebble mill is now very commonly used, and those using these mills have experienced advantages commensurate with the extra outlay. There is no reason against, and several good reasons for, the use of a mill in preparing slip intended for dust press operations. For this purpose I would recommend the continuous mill of the Hardinge type equipped with a self feeding device. Some misgiving was felt as to the uniformity of the slip delivered; would the mixture be complete, or would the easily supported clay particles be discharged more readily than the spar or flint? Would the difference in specific gravity of the materials influence the result unfavorably? Would the vegetable matter, small pieces of wood and the like do harm if milled up with the body?

So far as segregation in any form is concerned there need be no concern as the slip produced is perfectly uniform. Differences in specific gravity of the several constituents of the mix need give no concern as the gravities vary only between 2.58 and 2.65. Other proof of this, if needed, can be found in the fact that lithopone consisting of barium sulphide and zinc oxide has for some years been ground in a 60 x 22 cone type mill to a fineness of 96 per cent through a 200 mesh screen. When these mills are used in the mining industry it is necessary to use Dorr or other classifiers to separate fines of very great specific gravity differences.

In regard to chips of wood and other vegetable matter: it is astonishing how little effect a pebble mill will have on moderately soft material—corks, pieces of wood, rubber pump valves, intentionally put into mills, have sustained remarkably little abrasion on even long mill runs. On one occasion a four fold 12-inch ivory pocket rule was accidently included in a mill charge which

ran 8 hours. Even this did not suffice to completely erase the marks on the rule; no other damage was noted except a very slight rounding of the edges—even the German silver end pieces and hinges suffered no injury.

The mill should discharge directly through a strainer into the electro-magnet box and thence flow directly to the lawn. The usual agitator would receive the slip from the lawn, followed by the customary filter pressing operation, which however, should be pressed up pretty well so as to give a cake carrying as little water as possible, and as small a soft core as practicable—if this is not removed.

Ordinarily the clay on leaving the presses will contain from 21–22 per cent water on the wet basis. In common current practice this clay would be dried, then wetted down, tempered, aged and ground. Instead of drying out so much water a great economy of time and steam can be effected and better dust obtained if the clay is put into a drier and only so much water dried out as it is necessary to remove for the desired end in view, *viz.*, a product containing about 16 per cent water. This means the removal of only 5–7 per cent of water. That this is not only possible but also highly desirable is attested by the results.

Two hundred and twenty-one pounds of freshly pressed leaves were weighed up on a rack and put into an ordinary dry room with steam coils running around the sides—direct weighings showed that sufficient moisture had been removed in $5^1/_4$ hours after which period the clay was immediately disintegrated and pressed into bushings. The pressman volunteered approval of the dust (which in itself is noteworthy). The pressed bushings were dried, cleaned, glazed and fired as usual and produced very good ware. It is well to note that in drying clay the first few per cents of water are the easiest of all to remove. If properly controlled an ordinary dry room may be operated quite successfully. Under proper care the filter presses may be made to deliver leaves of very constant average moisture content which renders dry room operation more easy and certain.

In another experiment 250 pounds of press leaves were treated in the same way taking again $5^1/_4$ hours to dry sufficiently and the results were entirely satisfactory in every way.

Clay so handled seems to be a little easier on the dies and fills out better although no tests have been made to see if the more difficult pieces could be made better with this clay. It may be safely predicted that an advantage in this respect would be gained also. A further drying test was made using a commercial humidity drier which required $6^1/_2$ hours to reduce the moisture from 21.9 per cent to 16 per cent and tests showed that the clay was delivered very uniformly indeed.

Supposing now we wish a clay having 16 per cent of moisture: it is necessary to remove from 106.3 pounds of wet clay, 6.3 pounds of water to yield 100 pounds of dust carrying the predetermined 16 per cent moisture. A universally felt difficulty in drying clay at high speed is the difficulty of establishing and maintaining even distribution and a practical industrial device that can be regulated and depended upon to do this is very desirable. As we know, the disintegrator is likewise a pretty good fan. As it disintegrates and delivers the clay it also delivers considerable air which, experiment has shown, has very little drying effect on the dust. Now a good high speed disintegrator with properly inclined blades will disintegrate clay direct from the press provided the moisture is not much in excess of 21 per cent. A machine having 6 blades and travelling 1800 R.P.M. with a 26-inch rotor did this quite nicely.

By applying hot blast in a suitable manner to the clay dust leaving the mill outlet the clay might be air supported at high temperature long enough to dry it sufficiently. This at first sight seems visionary but considering the enormously extended surface of the clay when broken into fine particles no insuperable difficulties present themselves. For example consider the beforementioned case where 6.3 pounds of water had to be removed from 106.3 pounds of wet clay. Suppose that we are using a fan delivering air at 192°F. This will take up slightly more than its own weight of water in becoming saturated at this temperature. The actual ratio is 0.0205 pound of air to 0.0254 pound of water; therefore we should require 4099 cubic feet of air, theoretically, but allowing for unavoidable loss and necessary safety factor, we will assume an input of 8,000 cu. ft. of air at 192°F. To heat this air from 70°F to 192°F will require between 1200 and 1300

B.t.u. or in terms of coal it is about equivalent to one pound of fairly good coal. Now the drying of press leaves in drying rooms is not nearly so efficient as this because of the enormous losses incurred, but the present toleration of these losses, is no argument for a continuation of such wasteful methods. Indeed the modern spirit of conservation demands that such methods be abandoned.

The procedure here suggested is very much like that successfully practiced in the preparation of milk powder; in this industry the milk is concentrated in vacuum evaporators till a certain predetermined density has been attained, at which time it is discharged with the aid of a blast into a large space. This operation produces a cloud which on settling, is the milk powder of commerce. Several considerations brought about this very beautiful industrial method, chief of which was the fact, that by this means the undesirable flavor brought about by too high concentration in the liquid state is avoided. The sudden exposure of the hot, thick milk in a finely divided state causes the final removal of moisture that changes the liquid suddenly into a powder; this sudden evaporation causes also a sudden cooling which is one desirable feature of the process.

The problems of producing milk dust and clay dust by this process are quite closely analogous, the clay problem being far the easier. It should be borne in mind that while the air is assumed to be at 192°F the clay would never approach this temperature as it would perform the wet bulb function of the hygrometer. The arrangement, proportions, and construction of the suggested drying shafts need not be dealt with here, as they would depend largely on local circumstances.

In a plant producing slip and dust by the methods here outlined the time saving would be very material. The following figures have already been obtained for one ton of clay mix figured dry.

	Hrs.	Min.
Milling	1	..
Lawning	0	50
Filter pressing	1	10
Drying (ordinary drier)	5	15
Disintegrating	0	30
	8	45

Eight hours and 45 minutes from bin to press room. If the dust is made directly from the press cake at least $4^1/_2$ hours could be deducted from this figure making the time for the clay in process four hours and fifteen minutes with clay dust coming along at the rate of 2320 pounds per hour on the basis of the size of the mill assumed together with its complement of lawn, filter presses and disintegrator. This would make it easily possible to place pressed ware in the dry rooms the same day that the clay, etc., was made into slip.

It is important to bear in mind that dust made in this way is considerably better than dust as ordinarily made. There would be better time made at the presses, less loss, less scrap and in the trucking and cleaning less breakage would be incurred and better ware secured. The only point that has not been experimentally established is the hot air blast drying and it would appear that any pottery would be more than justified in incurring the necessary expense involved in standardizing this one feature in view of the economies already demonstrated.

A SMALL GLASS TANK[1]

By H. T. Bellamy

ABSTRACT

The construction of the furnace is shown in the figure. It is fed from the 3 burners and uses about 24,000 cu. ft. of B.t.u. gas per 24 hours. It successfully melts high lead crystal, alabaster, opal, gold ruby opalescent, and green opalescent glasses.

The small glass tank to be described was built to be used in place of small pot furnaces for the manufacture of lead glasses. An output of about 500 pounds per day was desired and a melting chamber of this capacity was devised with standard tank blocks. The method of heating was given special consideration, for the strong assertions in the literature, that lead glass can not be melted in open pots or in tanks without discoloration, raised some uncertainty as to the success of the furnace.

We had made quite a variety of lead glasses in small open pots with only occasional signs of discoloration, but the greater area of glass exposed to the flame and to the products of combustion would of course tend to increase the reduction of the glass by the gases. It was decided to fire the furnace in such a manner that combustion might be as complete as practicable. Uncarburetted blue water gas was the fuel available and various systems of premixing air with this gas were considered. The Surface Combustion Company's equipment was finally decided upon. In this system the gas pressure is boosted to 10 or 12 pounds by a water-sealed pump. A valve and a gauge at each burner control the distribution of the gas. As the gas passes through the burner nozzle into a throat at high velocity, the pressure energy is transformed into velocity energy and air is induced into the throat through an adjustable shutter. The gas and air mixture then goes through a Venturi tube to facilitate thorough mixing before passing on to the burners.

[1] Received January 25, 1922.

To obtain the best combustion, especially at low temperatures, even with the proper mixture of gas and air, the gases issuing from the burner should be obstructed in some manner such as by impinging on or brushing against a surface or by the impact of opposing flames. It was at first planned to have the flames from burners on opposite sides meet a few inches above the surface of the glass. This idea was abandoned on account of the difficulty of accurate adjustment of opposing burners, and in its place was

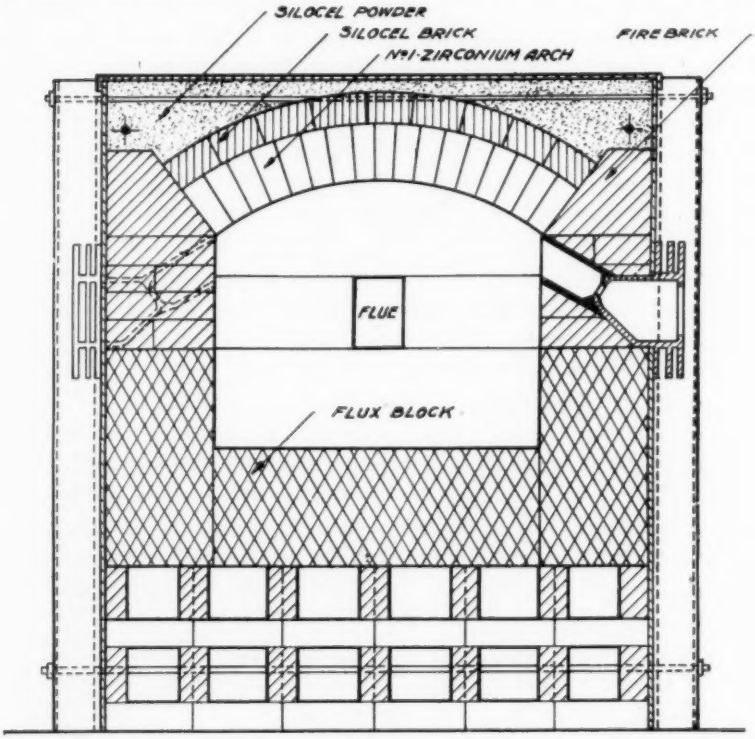


FIG. 1.

substituted the plan of inclining the burners at an angle of 30° from the horizontal so that the flames would brush against the arch. This scheme was followed when the furnace was installed and has given very satisfactory results. The furnace was first built with five burners staggered, two on one side and three on the

other but later two of the latter were removed, as three burners were found to be adequate.

The accompanying sketch is a cross section of the furnace as it was put into service. The first arch, built of silica brick, spalled and cracked badly on heating up. The silica brick were replaced with an arch of zirconium silicate brick, laid in zirconium silicate containing about 5% clay. This arch has been in service about one year and is still in very good condition. When it is necessary to replace corroded tank blocks, the arch is removed brick by brick and set up again. This is possible because there is no fluxing of the bonding material or the brick.

The time required to bring the furnace up to glass melting temperature depends on the moisture in the refractories. A newly constructed furnace should not be heated up in less than four days but thereafter the furnace may be cooled off and heated up over the week end without greatly increasing the depreciation. This feature is quite an advantage in the making of glass periodically without pot arches. It permits the making of repairs on the furnace equipment or the fuel and power lines without an excessive loss of time in bringing the furnace up to temperature.

The operator controls the temperature and combustion conditions of the furnace with a valve in the gas line and a shutter on the burner. At each burner are spring gauges sufficiently sensitive to permit adjustment to fractions of an ounce. The gas pressure indicated by the gauge in the by-pass is quite constant and with the accurate adjustment of burners to a predetermined pressure, a very constant temperature is maintained for long periods without attendance.

In operating the furnace, the batch is shoveled into the tank at intervals until the melted glass is up to the glass line giving a depth of seven inches when the tank blocks are first put in service. This depth increases as the bottom blocks are dissolved by the glass. The initial cubical content of the glass melting space is about $4^1/_2$ cubic feet. We have melted in this tank high lead crystal glass, alabaster, opal, gold ruby opalescent and green opalescent glasses. Occasionally there is a slight tinge of green to the crystal and alabaster glasses due apparently to too rich gas

mixture. Accurate records on the gas consumption are not available, but from the data on hand the fuel required per 24 hour period is approximately 24,000 cubic feet of 300 B.t.u. gas.

MANUFACTURING DEVELOPMENT DIVISION
HAWTHORNE WORKS
WESTERN ELECTRIC COMPANY, INC.

CORRECTION

"A Comparative Study of American and German Quartzites as Raw Materials for the Silica Brick Industry," by K. Endell (*This Jour.*, **4**, 956–57(1921)). The cuts on pages 956 and 957 should be interchanged.

Vol. 1 MARCH, 1922 No. 3

Ceramic Abstracts

EDWARD W. WASHBURN, Editor
Ceramics Bldg., Urbana, Ill.

ABSTRACTORS: E. N. BUNTING, W. M. CLARK, G. S. FULCHER, S. L. GALPIN, SEIJI KONDO, A. T. MALM, R. J. MONTGOMERY, LOUIS NAVIAS, C. W. PARMELEE, C. M. SAEGER, JR., H. G. SCHURECHT, R. B. SOSMAN, H. F. STALEY, E. W. TILLOTSON.

Author Index[1] to Abstracts for March

Author	Number of abstract
Anon...13, 31, 32, 38, 53, 66, 77, 78, 87, 89, 95, 98, 120, 124, 125, 130, 134, 135, 141, 145, 147, 148, 149, 150, 152, 153, 154, 155, 156	
Ascher, Franz H.	25
Baldermann, J.	75
Baylor, H. D.	167
Beach, L. M.	24
Beckman, J. W.	2
Beecher, M. F.	118
Berry, H. C. and Hart, L. H.	146
Beutel, Ernst.	108
Bitting, A. W.	70, 79
Blum, Ascher	85
Bogue, Robert H.	10
Breerwood, C. H.	44, 45
Brown, Wilbur F.	102
Buckingham, E.	21
Buckman, H. H. and Pritchard, G. A.	49
Burchard, Ernest F.	163
Charlton, H. W.	174
Cole, C. A.	101
Connick, C. J.	65
Craver, Harrison W.	100
Crow, W. and Schaffer, J. C.	169
Deussing, P.	7
Didier, C.	139
Dodge, H. K.	119
Duschak, L. H.	39
Emley, Warren E. and Marani, V. G.	151
English, S., Hodkin, F. W., Muirhead, C. M. M. and Turner, W. E. S.	82
F. Z.	109
Firth, E. M. and Turner, W. E. S.	6
Flusin, G.	104, 105
Formby, G. M.	171
Frazier, C. E.	76

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts*, by coöperative agreement.

mixture. Accurate records on the gas consumption are not available, but from the data on hand the fuel required per 24 hour period is approximately 24,000 cubic feet of 300 B.t.u. gas.

MANUFACTURING DEVELOPMENT DIVISION
HAWTHORNE WORKS
WESTERN ELECTRIC COMPANY, INC.

CORRECTION

"A Comparative Study of American and German Quartzites as Raw Materials for the Silica Brick Industry," by K. Endell (*This Jour.*, **4**, 956–57(1921)). The cuts on pages 956 and 957 should be interchanged.

Vol. 1 MARCH, 1922 No. 3

Ceramic Abstracts

EDWARD W. WASHBURN, Editor
Ceramics Bldg., Urbana, Ill.

ABSTRACTORS: E. N. BUNTING, W. M. CLARK, G. S. FULCHER, S. L. GALPIN, SEIJI KONDO, A. T. MALM, R. J. MONTGOMERY, LOUIS NAVIAS, C. W. PARMELEE, C. M. SAEGER, JR., H. G. SCHURECHT, R. B. SOSMAN, H. F. STALEY, E. W. TILLOTSON.

Author Index[1] to Abstracts for March

Author	Number of abstract
Anon... 13, 31, 32, 38, 53, 66, 77, 78, 87, 89, 95, 98, 120, 124, 125, 130, 134, 135, 141, 145, 147, 148, 149, 150, 152, 153, 154, 155, 156	
Ascher, Franz H.	25
Baldermann, J.	75
Baylor, H. D.	167
Beach, L. M.	24
Beckman, J. W.	2
Beecher, M. F.	118
Berry, H. C. and Hart, L. H.	146
Beutel, Ernst.	108
Bitting, A. W.	70, 79
Blum, Ascher	85
Bogue, Robert H.	10
Breerwood, C. H.	44, 45
Brown, Wilbur F.	102
Buckingham, E.	21
Buckman, H. H. and Pritchard, G. A.	49
Burchard, Ernest F.	163
Charlton, H. W.	174
Cole, C. A.	101
Connick, C. J.	65
Craver, Harrison W.	100
Crow, W. and Schaffer, J. C.	169
Deussing, P.	7
Didier, C.	139
Dodge, H. K.	119
Duschak, L. H.	39
Emley, Warren E. and Marani, V. G.	151
English, S., Hodkin, F. W., Muirhead, C. M. M. and Turner, W. E. S.	82
F. Z.	109
Firth, E. M. and Turner, W. E. S.	6
Flusin, G.	104, 105
Formby, G. M.	171
Frazier, C. E.	76

[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts*, by coöperative agreement.

Author Index to Abstracts for March (*Continued*)

Author	Number of abstract
Funk, W	63
Gibson, K. S., Tyndall, E. P. T. and McNicholas, H. J	88
Gray, D. E	116
Greenleaf, L. S	52
Haddon, C. L	157
Hall, A. L	16
Hartmann, M. L	50
—and Koehler, W. A	43
Heath, A. and Leese, A	58
Hering, R., Hammond, G. T. and Provost, A. J., Jr	131
Hess, Henry W	103
Hill, E. C	127
Hirsch, H	1
Hull, Walter A. and Crockatt, Chas. C	133
Huth, F	93
Jäger, F. M. and van Klooster, H. S	18
Jones, Chester H	121, 122
Kautzky, H	12
Kleinlogel, Dr	140
Koch	128
Krak, J. B	71, 84
Kregelius, L. M	172
Kreisinger, Henry	33
Kruss, M	35
Kühl, Hugo	73, 142
Ladoo, R. B	137
Lesley, Robert W	162
Lindley, W	57
Little, A. D	159
Loughlin, G. F. and Coons, A. T	161
Lux, E	42
Maetz, O	37
Maitland, A. G	17
Marden, J. W. and Rich, M. N	41
Marston, Anson and Stewart, J. T	132
Mellor, J. W	59
Milner, E. E	81
Milner, R. and Robinson, T	136
Moore, B. J	23, 60
Morgan Crucible Co. Ltd. and Spiers, C. W	46
Müller, Fr	62
Mylius, F	96
Myott, Ashley	56
Newland, David H	26, 28
Newman, H. S	5
Nutting, P. G	22
Odelberg, A. S. W	61
Parkert, O	69
Peddle, C. J	111
Phillips, F. J	29
Pink, M	90
Plusch, H. A	126
Poste, Emerson P	123
Pulfrich	11
Purdy, R. C. and Fulweiler, W. H	30
R	91
Ramann, E. and Junk, H	15
Rayleigh, Lord	99
Riddle, F. H. and Laird, J. S	54
Ruff, O. and Mugdan, Susanne	9
Ruppel, F. C	170
S. E	55

Author Index to Abstracts for March (*Continued*)

Author	Number of abstract
Scales, F. M. and Marsh, Franklin W	8
Schaffer, J. C	168
Schneider, Paul	36
Schnurpfeil, P. K. Eduard	97
Schott, F	158
Schuen, W	4
Schwaner, J. M	112
Schwarz, Robt. and Bausch, Hans	19
Schwarz, Robt. and Haacke, A	14
Seaton, Max Y	143
Seldon, Henry W	72
Shackelton, W	83
Shelley, H. T. and Emley, Warren E	129
Showers, L	115
Silverman, Alexander	86
Skerrett, Robt. G	106
Spencer, G. L	80
Spielman	3
Splittgerber, A	165
Springer, J. F	94, 107
Springer, Ludwig	92
Stock, Alfred and Somieski, Karl	20
Stoll, A	138
Stowell, E. R	173
Suchy, G	74
Sullivan, E. C. and Taylor, W. C	113
Swanson, H	114
Thiene, H	110
Thompson, J. G	40
Thompson, S. E. and Goldbeck, A. T	144
Tillotson, E. Ward, Jr	67
Tomlinson, C. L	117
Travis W., Watson, T. H. and Co. Ltd	48
Umeda, Otogorô	64
Wallin, E	166
Watts, Arthur S	27
Weiss, J. and Becker, Dr. Ing. H	34
Welch, H. V	175
Wildner, Frank A	160
Wilhelm, Otto	68
Wilkes, A. L	47
Willetts, P. G	51
Witt, J. C	164

General and Miscellaneous

1. Osmosed clay. H. HIRSCH. *Tonind. Ztg.*, **45,** 1243–45(1922).—In a trough-like compartment of the electrosmotic separator are two stirrers which keep the clay agitated. Above these is a slowly revolving drum which is charged positively with an electric current. A few inches below the drum is a wire screen which is negatively charged. The impurities which are positively charged are caught on the screen and washed away while the clay which is negatively charged is attracted to the drum where it is dewatered by electrosmosis and is scraped off by means of long knives into trucks. The clay to be treated by this method is first subjected to a preliminary treatment similar to that used in this country. The clay is blunged with water and electrolytes and slowly passed thru troughs in which the quartz and mica are removed. It is then screened thru vibrating screens and passed over electro magnets and finally passed into large settling tanks. The slip is allowed to stand in these tanks sufficient to remove more of the impurities. The slip remaining in suspension is then run thru the electrosmotic machines of which the Westwälder works has 8. Each machine has a capacity of 8 tons per 24 hrs. A filter press operated on the electrosmotic principal is also described. The raw clay in this case contained considerable quartz and pyrites, and about 60–66% clay substance and had a softening point of cone 31. The osmosed clay contained above 90% clay substance, had a softening point of cone 33 and a much lower vitrification point than the untreated clay.

H. G. SCHURECHT

2. Ceramics as a by-product of coal mining in Sweden. J. W. BECKMAN. *Chem. Met. Eng.*, **25,** 882.—The thickness of the coal seams in the industrial center of Höganäs, Sweden, varies from 30 to 60 cm. In between the coal seams there are clay and carboniferous slates. These clays have to be mined simultaneously with the coal to make it economical and feasible to bring it out. The clay-products manufacture is now the main operation at Höganäs. The clay, originally a waste product, has become of prime importance, and the quality of the products produced from it has become famous not only in Sweden but in many other countries. *Firebricks, paving bricks, common building bricks, chemical ware, acid proof bricks, terra cotta products, sewer pipes, sanitary ware and household articles are all being made.* The carbonaceous shales are piled in the open and set on fire. They burn completely, leaving a dense well-burned chamotte which is very desirable for the manuf. of pressed brick and other clay products. The company operating the works at Höganäs also operates an elec. furnace plant at Trollhättan, where *alundum* and *carborundum* are produced, and these products are used here as elsewhere in the manuf. of *highly refractory bricks.* Electrodes are also a product of this plant, their manuf. being virtually a cer. industry, though utilizing different raw mats.

H. F. S.

3. Blasting with liquid air. SPIELMAN. *Tonind. Ztg.*, **60,** 519(1921).—Discussion as to possibilities for replacing blasting powder and dynamite. Theoretically 1 kg. liquid air possesses as much energy as 2.2 kg. gelatine

dynamite. Found to be impracticable for quarrying purposes. Suitable for mining, but uneconomical owing to necessity of too large scale production, transport and storage difficulties. WM. M. CLARK

4. Method of burning salt glazed ware. W. SCHUEN. *Tonind. Ztg.*, **54,** 454(1921).—Describes process as carried out by the author. WM. M. C.

5. Contraction of some quaternary (ceramic) mixtures fired to different temperatures. H. S. NEWMAN. *Trans. Ceram. Soc.*, **19,** 132–39(1919–20).—Slabs were prepd. from ball clay, china clay, stone, and flint in varying proportions, and some of each batch were fired in a saggar to cones 1*a*, 6*a*, and 8. Half were then dipped in a lead glaze and half in a leadless glaze and fired to cone 3*a*. The contraction at cone 016 was less in the majority of cases than the dry contraction, showing that at a certain temp. there is an expansion, probably due to the liberation of combined H_2O. Until the proportion of stone to flint falls below 3:2 the replacing of ball clay by china clay raises the contraction, and after this proportion is passed the reverse action takes place at the temp. of cone 1*a*. For cones 6*a* and 8 the proportion of stone to flint must be below 2:3 before the reversion occurs. The contraction does not always rise with the temp., but with some mixts. it reaches a max. and then falls again. The gradual substitution of one clay for the other, with the other materials remaining const., does not have a direct bearing on the contraction nor does the change from stone to flint while keeping the clays const. A large variation can be made in the proportions of ingredients used without affecting the working properties or causing crazing or peeling.

J. S. C. I.

6. Effect of added feldspar on the shrinkage and porosity of aluminous fireclays after being fired at high temperatures. E. M. FIRTH AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **4,** 392–400(1920).—In a previous paper (*C. A.*, **14,** 3514) the authors had noted that, of clays which they examd., those of high Al_2O_3 content showed, with two exceptions, the widest range of porosity on firing. It is now shown that if 1 or 2% of feldspar is added to the two exceptional aluminous clays (to act as a flux during firing) the shrinkage is rendered more uniform, and there is a considerable increase of porosity range.

J. S. C. I.

PATENTS

7. Artificial meerschaum. P. DEUSSING. Brit. 164,319, May 25, 1921. Artificial meerschaum consists of Hallic earth, raw Meissner clay, whitening, and quartz dust. The Hallic earth may be replaced by roasted Meissner clay, and feldspar, MgO, or potash may be added to increase the flexibility of the mixt. The ingredients, after being separately pulverized, are ground together with H_2O into a semi-liquid paste which is cast in dry gypsum molds. After a few minutes, the still liquid portion is removed from the mold leaving a hollow casting, which is dried in the mold, roasted and oiled or waxed. An example of proportions is 30 pts. by wt. of Hallic earth, 10 of Meissner clay, 4 of whitening, and 8 of quartz dust, to which 50 pts. of H_2O are subsequently added. (*C. A.*)

Apparatus and Instruments

8. The Tyndallmeter reading of soil dispersoids. F. M. SCALES AND FRANKLIN W. MARSH. Bureau of Plant Industry, U. S. Dept. of Agriculture, Washington, D. C. *Jour. Ind. Eng. Chem.*, **14,** 52–54(1922).—A method is described whereby the conc. of the colloid in a clay can be approx. and rapidly detd. by shaking up the clay with water, allowing it to settle and measuring the strength of the Tyndall beam. ED.

9. High temperature studies. XIII. The measurement of vapor pressures at high temperatures and the vapor pressures of alkali halides. O. RUFF AND SUSANNE MUGDAN. *Z. anorg. allgem. Chem.*, **117,** 147–71(1921); cf. *C. A.*, **13,** 3054.—By measuring the loss in wt. of the substance held at temps. first slightly above that at which the phenomena of boiling are first noticed, and then at somewhat higher temps. and for different pressures, it is possible to det. the vapor pressure of solids at high temps. The temp. may be reached in a Heraeus furnace with Ni-wound tubes for temps., up to 1200° and in a C resistor furnace for high temps. Temp. is measured with an optical pyrometer for which calibration data are given. During the course of a detn. N is passed through the system at such a rate as to keep its pressure practically const. The container or boiling flask depends on the substance under examn.; for metals, which have a relatively high surface tension, it may be of porous C or graphite; for salts, which have a lower surface tension, optically opaque quartz (opaque at the temp. used) is better. For metals these containers should not have a capacity greater than 0.2 cc. while for salts 0.6–0.7 cc. is necessary. The method was checked up using previously obtained data on the vapor pressures of As, Sb, Bi, and Cu, all of which data are included in the article. Using this method then, the vapor pressures of the alkali halides were detd. The data cover from 7 to 9 points on the curve and the vapor pressure range is from 40 to 60 mm. up to the b. p. The heats of vaporization and the crit. temps. are calcd. Finally, a comparison is made between the obs. values and those calcd. by the Ramsay-Young rule; the latter is shown not to hold exactly. E. H. D. (*C. A.*)

Chemistry, Physics and Geology

10. The swelling and gelation of gelatin. ROBT. H. BOGUE. Mellon Institute, Pittsburgh, Pa. *Jour. Ind. Eng. Chem.*, **14,** 32–35(1922).—A study of the degree of swelling, viscosity, alcohol number and *pH* value upon gelatin mixed with sodium silicate, in which the ratio of Na_2O to SiO_2 was varied between 1:4 and 1:1. ED.

11. The transition of quartz into tridymite. PULFRICH. *Tonind. Ztg.*, **45,** 1127–28(1921).—A summary of the observed facts regarding the influence of various substances upon the velocity of transition. Cf. *Jour. Am. Ceram. Soc.*, **4,** 421. H. G. SCHURECHT

12. Some unsaturated silicon compounds. H. KAUTZKY. *Z. anorg. allgem. Chem.*, **117,** 209–42(1921).—The action of HCl on $CaSi_2$ results in the

formation of a mixt. of 3 substances. In order to obtain them pure, the action of alc. HCl, contg. varying amts. of aq. HCl, was studied. Very dil. HCl contg. a large excess of alc. yielded a white, very little sol. cryst. substance of the compn. Si_2H_2O, to which the name *oxydisiline* is given. It has the following properties: Stable to 140°; at higher temps. it is decomposed into gaseous products readily inflammable in air; H_2O decomposes it slowly, more rapidly in heat or light, yielding a self-inflammable gas and H; alkalies and aq. NH_3 cause the reaction to become violent; dry NH_3 reacts above 0° to give nitrogenous compds. which with alc. yield org. Si compds.; it is a vigorous reducing agent—HNO_3 and H_2O_2 react explosively, H_2SO_4 is reduced to H_2S, P_2O_5 to PH_3 in the presence of alc. and many metals are precipitated from solns. of their salts. Treatment of well cooled Si_2H_2O, suspended in CS_2, with a dil. CS_2 soln. of Br gives the yellow compd. *silical bromide*, $(Si_2OH)Br$, so named because it is derived from the new radical, *silical* (Si_2OH). Oxydisiline can be converted into silical derivs. by the action of Cl, $CHCl_3$, CCl_4, C_2H_5I, aq. HCl, H_2SO_3. By hydrolysis of silical bromide, K. prepared dark brick-red *silical hydroxide*, $(Si_2OH)OH$, which is a base forming yellow, readily hydrolyzed *salts* such as halides, sulfate, phosphate, formate and acetate. No solvent for any of the silical compds. was found. These compds. can be oxidized to silicic acid, which is the third product referred to above. The supposed compd. "silicone" obtained by Wöhler (*Ann.*, **127**, 264(1863)) and by Hönigschmidt (*C. A.*, **4**, 30) as a result of the action of aq. HCl on $CaSi_2$ is undoubtedly a mixt. of the 3 substances isolated by K. Analytical and crystallographic data are given in some detail and it is pointed out that the oxydisiline, the silical compds. and finally the silicic acid are pseudomorphs of the original $CaSi_2$. The structures, $Si_2OH.H$ and $Si_2OH.X$, are proposed for the oxydisiline and the silical compds., resp., but it is suggested that the salts of the latter may be oxonium compds. of the type $Si_2O.HX$. For the unsatd. character of these Si compds. no satisfactory explanation is given; they may be analogous to compds. of bivalent C. E. H. DARBY
(*C. A.*)

13. Indian bauxite. ANON. *Tonind. Ztg.*, **64**, 551, 552(1921); *Chem. Trade J. and Chem. Eng.*, **2**, 4, 441(1921).—Describes compn., occurrence, applications of bauxite. The Indian deposits were discovered in 1907, and promise to be an important source of pure bauxite in the world trade.
WM. M. CLARK

14. Binary systems of lithium orthosilicate with zirconium orthosilicate and with calcium orthosilicate. ROBERT SCHWARZ AND A. HAACKE. Freiburg i. B. *Z. anorg. allgem. Chem.*, **115**, 87–99(1921); cf. *These Abs.*, **1**, 6(1921).

15. Basic exchange in silicates. III. E. RAMANN AND H. JUNK. *Z. anorg. allgem. Chem.*, **114**, 90–104(1920).—In continuation of previous work (*C. A.*, **11**, 2174; **14**, 256), the formation of Mg permutite by the action of Mg salts on NH_4, Na, and K permutites has been studied. As in other cases, the reaction is ionic, and there is no evidence of physical adsorption. Pure

Mg permutite could not be obtained, not more than half of the bases present in the original permutite being displaced by Mg. The whole of the NH_4 in NH_4 permutite could not be displaced by treatment with carnallite or kainite solns. Mixed salt solns., decompose the permutite to some extent, especially solns. contg. Mg or NH_4. This observation may have some bearing on the decompn. of natural silicates, which can not always be adequately accounted for by the action of water and H_2CO_3. J. C. S.

16. Corundum. A. L. HALL. Geol. Survey, *Mem.*, **15**(1920) (Dept. Mines and Industries Union of S. Africa); *Bull. Imp. Inst.*, **19**, 93–4(1921).—The Transvaal corundum deposits are said to be the largest and most important yet discovered. It is concluded from the geological relationships that the corundum has originated from an excess of Al_2O_3 occasioned by some of the SiO_2 in pegmatites of granitic origin being abstracted by the basic rocks into which the pegmatites have been intruded. R. L. S. (*C. A.*)

17. Magnesite. A. G. MAITLAND. W. Australia Geol. Survey, *Mem.*, No. **1**; *Bull. Imp. Inst.*, **19**, 100–1(1921).—Analyses of 8 samples of magnesite from 5 different deposits in W. Australia show MgO from 44.31 to 47.36% and CO_2 from 47.76 to 51.69%. The magnesite is found on the surface as an alteration product of serpentinized rock. R. L. SIBLEY (*C. A.*)

18. Researches in the chemistry of the silicates. F. M. JÄGER AND H. S. VAN KLOOSTER. *Sprechsaal*, **52**, 256(1919); *J. Soc. Glass Tech.*, **3**, 234–6.—The silicates were prepd. by first heating a mixt. of quartz and the metal carbonate or oxide to the sintering point in an Ir-free Pt dish in an elec. oven, and then completing the fusion in a Fletcher gas furnace. The silicates of Ba, Sr, Be, Zn, and Cd were white and cryst.; that of Zn showed a blue to violet coloring, while those of Mn developed a brown color. In the following table are stated some of the properties of the silicates. n_1 and n_2 are the refractive indices for uniaxial crystals, and n_1, n_2, and n_3 for biaxial. It was found that the meta-silicates have m. ps. which are related linearly to the at. wts. of the metals, the m. ps. rising with increasing at. wts. in the case of Ca, Sr, and Th, and falling with Mg, Zn, and Cd.

Substance	M. p.	Sp. gr.	Refractive indices	Special remarks
$BeSiO_3$[1]	> 1750°	—	— — —	———
$MgSiO_3$[2]	1554°	3.175	$n_1 = 1.641$; $n_2 = 1.648$; $n_3 = 1.663$.	———
Mg_2SiO_4	1750°	—	— — —	———
$CaSiO_3$[3]	1540°	—	$n_1 = 1.609$; $n_2 = 1.650$.	———
Ca_2SiO_4[3]	2130°	3.27	$n_1 = 1.714$; $n_2 = 1.720$; $n_3 = 1.737$.	———
$SrSiO_3$[4]	1578 ± 1°	3.652	$n_1 = 1.620$; $n_2 = 1.590$.	The melt can be supercooled to 1225° when sudden rise of temp. to 1364° accompanied by crystn. takes place. By rapid cooling of the melt, an almost isotropic glass can be obtained with $n = 1.618$, sp. gr. 3.540, and by careful heating a micro-crystalline variety is obtained.
Sr_2SiO_4[4]	> 1750°	—	— — —	
$BaSiO_3$[4]	1604°	4.435	$n_1 = 1.670$; $n_2 = 1.667$.	———

$BaSiO_4$[4]	1750°	—	—	—
$ZnSiO_3$[4]	1437 ± 1°	3.52	$n_1 = 1.623$; $n_2 = 1.616$.	Small, weakly double refracting cystals. Attempts to obtain the substance as a glass were unfruitful.
Zn_2SiO_4[4]	1509°	—	$n_1 = 1.719$; $n_2 = 1.697$.	Weakly double refracting crystals.
$CdSiO_3$[4]	1242°	4.928	Both > 1.739.	Crystals identical with *Willemite*.
Cd_2SiO_4[4]	1252–1243°	—	Both > 1.739.	Crystals with strong double refraction.
$MnSiO_3$[4]	1273 ± 1°	3.716	$n_1 = 1.739$; $n_2 = 1.733$.	Crystals with strong double refraction.
Mn_2SiO_4[4]	1290–1300°	4.044	Both > 1.739.	Artificial *rhodonite*.
				Artificial Mn_2SiO_4 has no fixed m. p. Became dark colored on heating through decompn.
$CaMG(SiO_3)_2$[5]	1391°	3.275	$n_1 = 1.664$; $n_2 = 1.671$; $n_3 = 1.694$.	

[1] Observers: Jäger and van Klooster.
[2] Observers: Allen and Wright.
[3] Observers: Day, Allen, White, Shepherd and Wright.
[4] Observers: Jäger and van Klooster.
[5] Observers: Allen and White.

(*C. A.*)

19. The introduction of silicic acid into the nucleus of complex compounds. ROBERT SCHWARZ AND HANS BAUSCH. *Ber.*, **54**, 802–813(1921).—Among the more credible theories regarding the constitution of the Al silicates is that of W. Vernadsky, namely, that they are hydrates or salts of complex alumino-silicic acids. To cast light on the problem of the constitution of the *silicates*, the authors have studied the reactions of Na_2SiO_3 with complex compds. of known constitution, namely, hexamminocobaltic chloride, and chloropentamminocobaltic chloride. 1.25 g. Na_2SiO_3 in 50 cc. H_2O reacts with 2.5 g. $[Co(NH_3)_5Cl]Cl$ in 500 cc. H_2O to form *tetrasilicato-chloro-triammino-cobalt* $[Co(NH_3)_3Cl(Si_4O_9)]$. When dry, this is a reddish violet, fine, noncryst. powder. Heated at 120° it leaves marine-blue *cobaltous tetrasilicate*, $CoSi_4O_9$. It does not react with H_2O or cold dil. HCl, but hot HCl decomposes it, setting free all the SiO_2. Hot, strong NaOH soln. decomposes it with the sepn. of $Co(HO)_3$, which reaction was used in the quant. analysis of the compd. 50 cc. 2% soln. of Na_2SiO_3 and 2.5 g. $[CO(NH_3)_6]Cl$ in 500 cc. H_2O react forming a yellow-orange ppt. of *silicato-tetrammino-cobaltic chloride*, $[Co(NH_3)_4(Si_4O_9)]Cl$, which can be freed from small amts. of adsorbed H_2O only at 105° and with accompanying decompn. It is insol. in H_2O, is decomposed by dil. mineral acids, and even slowly by warm AcOH, setting free SiO_2. Heated, it decomposes according to the equation, $[Co(NH_3)_4(Si_4O_9)]Cl = CoSi_4O_9 + 4NH_3 + Cl$. Inasmuch as this silicato-complex is a cation, silicates of it should exist under suitable conditions. The reaction between 2.5 g. $[Co(NH_3)_6]Cl$ in 500 cc. H_2O and 2.5 g. Na_2SiO_3 in 50 cc. H_2O yields a yellow ppt. of *silicato-tetrammino-cobaltic silicate*, $[Co(NH_3)_4(Si_3O_7)]_2SiO_2$. This is the first synthetic silicato-silicate which has been prepd., and may be of interest in the interpretation of many reactions of the natural Al silicates. This compd. is decomposed by acids. When decomposed by heat, the product is not a simple substance. It was impossible to effect a sepn. of the Si within the nucleus from that in the SiO_3 anion. When the luteo-base, $[Co(NH_3)_6](OH)_3$, was treated with a suspension in H_2O of dioxo-disiloxane, $Si_2H_2O_3$,

there was formed the complex base, $[Co(NH_3)_4(Si_4O_9)]OH$, in which case the Si has entered the nucleus instead of forming a silicate with the complex as the cation. These facts add probability to the theory that many of the Al silicates are not silicates, but silicato-compds. in which Si radicals are coördinatively bound to the Al along with aquo–, oxo– and other groups, forming complex nuclei. The above compds. can be prepd. smoothly and free from by-products only by using cryst. Na_2SiO_3 and adhering strictly to the quantities and concns. specified in the article. R. H. LOMBARD (*C. A.*)

20. Siliconhydrides X. Nitrogen-containing compounds. ALFRED STOCK AND KARL SOMIESKI. *Ber.*, **54,** 740–58(1921); cf. *Jour. Am. Ceram. Soc.*, **4,** 1004.—The authors have studied the action of NH_3 on SiH_3Cl and SiH_2Cl_2. These reactions give N derivs. of monosilane which contain the groups SiH_3 and SiH_2, and many of which are volatile, simple mol. substances. These compds. form a new basis for the comparison of Si- with C-chemistry. Differences and similarities between the Si-N compds. and the analogous C-N compds. are discussed. *The preparation of* SiH_3Cl (b. p.—30°) *and of* SiH_2Cl_2 (b. p. 8°), which were used as starting substances in this research, is described. R. H. LOMBARD (*C. A.*)

21. On plastic flow through capillary tubes. E. BUCKINGHAM. *Proc. A. S. T. M.*, **21,** 1154–57(1921).—As the formula of Bingham and Green is only a very rough approx., the author math. develops the more exact formula for a steady flow through a long round tube and for the vol. rate of discharge. The effect on the vol. rate of discharge formula due to the introduction of Green's hypothesis of viscous slip is also given, together with a graph of the discharge curve. To reduce the importance of slip it is necessary to use large tubes. E. N. BUNTING

22. A study of elastic viscous deformation. P. G. NUTTING. *Proc. A. S. T. M.*, **21,** 1162–68(1921); *Frank. Inst. J.*, **191,** 679–85(1921).—A simple instrument which measures the force necessary to pull out a rod at a given rate from the mat. under investigation was used to study the viscous behavior of asphalt, stearine, pitch, hydrolene, and a mixt. of Tarvia X + MgO. It was found that the laws of viscosity ordinarily assumed did not in general apply, as the shearing strain is not in general proportional either to the shearing stress or to the time it is allied. The relation found to hold between stress s, time t, and stress or force F is given by $s = at^n F^m$, where a, n, and m are constants. This reln. includes as special cases relns. ordinarily assumed to hold for elastic solids ($n = 0$ and $m = 1$, Hooke's Law) and for viscous fluids ($n = 1$ and $m = 1$) and clears up the many difficulties and inconsistencies often encountered in viscosity measurements. Melting, softening, dropping, and other thermal points may be exactly defined by means of this new formula by assigning sp. values to any or all of the constants a, n, and m, while measuring s, t, and F in specified units. It is pointed out in the discussion, however, that the mats. investigated are plastic and that the laws of plastic bodies, which have not as yet been very well formulated, might not be the same as the viscosity law. E. N. BUNTING

23. An elutriation test for potters. B. MOORE. *Trans. Cer. Soc.*, **20,** 112–19(1921).—The app. is a one-can elutriator of the Shöne type with straight side and a cross-section of 34.47 inches so that a flow of one pint per min. gives a velocity of one inch per minute. The author believes the mean diam. of the coarser particles in elutriation tests have been estimated too high and consequently the surface factors have been too low. Emphasis is laid on the known fact that the sp. gr. of the mat. being elutriated is an important factor in detg. the size of particles that will be carried by a stream of given velocity. H. F. S.

24. Silica in 1920. L. M. BEACH. U. S. Geol. Survey, *Mineral Resources of U. S., 1920,* Part II, 151–2(preprint No. 17, published Oct. 11, 1921). E. H. (*C. A.*)

25. Crystalline magnesite at St. Martin, Salza. FRANZ H. ASCHER. *Z. prakt. Geol.*, **1917,** 66–9.—Pure, cryst. magnesite occurs at St. Martin on the Salza, 4 km. from Öblarn in Obersteiermark. Analyses of the mineral are given. It occurs in a bed averaging 15–20 m. thick and extending over a distance of 1100 m. E. F. HOLDEN (*C. A.*)

26. Mineral resources of the state of New York. DAVID H. NEWLAND. *N. Y. State Mus. Bulls.*, Nos. **223, 224,** 307 pp.(1919).—"This report is intended to serve the purpose of a general guide to the mineral resources of New York. It presents the principal facts regarding the character, occurrence and production of the useful minerals, with reference to particulars of the local features that bear upon their industrial utilization." For the year 1918 the value of *Portland cement, brick, pottery, other clay products, gypsum,* Fe ore, natural gas, petroleum, salt, sand and gravel other than molding sand, and limestone was over $1,000,000 each; the range being from 1.4 to 7.3 million dollars. The value of garnet, *graphite,* mineral waters, pyrite, *molding sand,* marble, sandstone, trap, granite, *talc,* and Zn ore ranged from $135,000 to $902,000. The total value of the mineral products for 1918 was over 54 million dollars. More than 100 chem. analyses of various mineral samples are recorded. L. W. RIGGS (*C. A.*)

27. Feldspar. ARTHUR S. WATTS. *Mineral Ind.*, **29,** 226–27(1920).—Production figures and a list of grinding mills are given. A. BUTTS (*C. A.*)

28. Garnet. D. H. NEWLAND. *Mineral Ind.*, **29,** 10–11(1920).—A discussion of the sources, use, market and production of abrasive garnet. A. BUTTS (*C. A.*)

PATENT

29. Soluble silicates. F. J. PHILLIPS. Brit. 163,877, April 9, 1920. Sol. silicates of high SiO_2 content are prepd. by dissolving silicic acid in alkali silicate solns. obtained by fusing SiO_2 and alkali, or SiO_2, alkali, and borax, and treating the cooled and broken melt with H_2O. The silicic acid is prepd., *e. g.*, by adding H_2SO_4 to cold water-glass soln., and after dialysis is dissolved in the silicate soln., by continued griding or agitation. Cf. 151,508 (*Jour. Am. Ceram. Soc.*, **4,** 317) and 151,399 (*C. A.*, **15,** 2699). (*C. A.*)

Refractories and Furnaces

30. Report of Committee C-8 on refractories. R. C. PURDY AND W. H. FULWEILER. *Proc. A. S. T. M.*, **21,** 315–16(1921).—The present tentative method for ultimate chem. anal. of chrome ores and chrome brick has been adopted as standard by the Society. A proposed method of test for resistance of fire-clay brick to spalling action has been adopted as tentative. Investigation of conditions under which refractory mat. are used in the steel industry is practically completed. A study on microstructure is also under way. E. N. BUNTING

31. Tentative method of test for resistance of fire-clay brick to spalling action. ANON. *Proc. A. S. T. M.*, **21,** 577–78(1921).—The object of the test is to detn. the resistance to spalling action by subjecting the brick to repeated rapid temp. changes. Instruction for the prepn. of samples and the detailed procedure are then given. E. N. BUNTING

32. Refractory brick for blast furnaces. ANON. *Brit. Clayworker*, **30,** 3(1921).—The brick should meet the following requirements: (1) resist. to abrasion, (2) resist. to the chem. action of slags, metals and gases, (3) resist. to high heat and (4) resist. to sudden temp. changes. The fire boxes and bottom of the furnace should be lined with brick having the compn. 63% Al_2O_3 and 37% SiO_2 and should be fired at 1300° C. H. G. S.

33. The importance of air supply in combustion of coal. HENRY KREISINGER. *N. J. Ceramist*, **1,** 39(1921).—A general discussion of the processes of combustion and their control in the opern. of hand-fired furnaces. C. W. PARMELEE

34. Application of coal in burning brick. J. WEISS AND DR. ING. H. BECKER. *Tonind. Ztg.*, **48,** 396, 397; also **56,** 469, **58,** 491(1921).—Describes many different types of ring furnaces with illus., and their advantages and efficiency. WM. M. CLARK

35. Short and long flames in gas firing. M. KRUSS. *Tonind. Ztg.*, **53,** 443(1921).—Concludes that short flames result when gas and air are instantaneously mixed at the burner and long flames when a gradual mixture of gas and air takes place. WM. M. CLARK

36. Unburned fire proof blocks. PAUL SCHNEIDER. *Tonind. Ztg.*, **49** 405, 406; also **52,** 434, **54,** 452, 453, 454(1921).—Detailed description of expts. with different mixts., influence of sizes of ingredients and effect of CaO, SiO_2, etc. WM. M. CLARK

37. Electric furnaces for melting glass. O. MAETZ. *Chem. Zentrblt.*, **25,** 709(1920); and *Sprechsaal*, **53,** 420(1920).—Describes arc type furnaces used in Sweden by A. B. Elektriska, Ungar, Stockholm. WM. M. CLARK

38. Sintered dolomite. ANON. *Tonind. Ztg.*, **53,** 492(1921).—Description of the dead burned product and amount of bond required. Concludes that for the Siemens-Martin Steel Furnace the best sintered dolomite contains 3% Al_2O_3 and Fe_2O_3 and 2.5% SiO_2. WM. M. CLARK

39. Extraction of calcium oxide from calcined magnesite. L. H. DUSCHAK. *Chem. Met. Eng.*, **23,** 628(1920).—CaO may be almost completely

extd. from magnesite after calcining at 900°–950° by leaching for several hrs. with water free from CO_2. If the magnesite has been calcined at higher temps., and especially if it is "dead burnt," the extn. is very incomplete and is not improved by fine grinding probably owing to the formation of an insol. compd.

J. S. C. I.

40. Electric-furnace purification of zirkite. J. G. THOMPSON. *Trans. Am. Electrochem. Soc.*, **40**, preprint(1921).—Zirkite ore was treated in elec. furnaces to remove the Fe, Si, Ti, and other impurities usually associated with it. It was found that the temp. required was too high for a resistance furnace. With an arc furnace 90–95% of the Si could be removed by heating the ore to 2220° or higher, provided coke was added in just the proper amt. to transform only the Si to carbide. The existence of stable double carbides of Si and Zr, or of solns. of SiC in solid ZrC, is suggested as an explanation of the incomplete removal of the Si when an excess of C is present. The further treatment of the ore with Cl or $COCl_2$ to remove the Fe is suggested.

W. E. RUDER (*C. A.*)

41. Investigations of zirconium with especial reference to the metal and oxide. J. W. MARDEN AND M. N. RICH. *Bur. Mines, Bull.* **186**, 146 pp. (1921); cf. *Jour. Am. Ceram. Soc.*, **3**, 765.—The work is divided into four parts, dealing successively with an historical review of Zr minerals, the salts of Zr, and the metal; exptl. work on Zr; the furnaces used; and a bibliography of Zr and its compds. Analytical methods are given for detg. Zr in ferrozirconium, steel, alloys such as Ni-Zr, and a method of sepn. of Ti, Cb, Ta and Zr. The phys. and chem. properties of amorphous and coherent Zr are fully listed. The cupferron method is the only one effecting complete sepn. of Zr and Al.

W. H. BOYNTON (*C. A.*)

42. The possibility of preparing high-grade silica bricks from quartzite rock. E. LUX. *Stahl u. Eisen*, **41**, 258–64(1921).—Good silica brick can be made from quartzite rock provided a sufficiently high burning temp. is used.

R. S. DEAN (*C. A.*)

43. Physical characteristics of specialized refractories. IV. M. L. HARTMANN AND W. A. KOEHLER. *Trans. Am. Electrochem. Soc.*, **40**, preprint (1921); cf. *Jour. Am. Ceram. Soc.*, **3**, 582; *ibid.*, **4**, 239; *ibid.*, **4**, 165.—The cross breaking strength of each of 10 refractories was detd. at 20° and 1350°. Within this temp. range chrome brick showed the most decided drop in modulus of rupture followed by bauxite, MgO, fire clay and SiO_2. Chrome bricks at 1350° have a breaking strength $^1/_{63}$ of their cold breaking strength. Two bonded SiC refractories showed an increase, indicating that the decrease occurs at a higher temp. than 1350°.

W. H. BOYNTON (*C. A.*)

PATENTS

44. Dolomite bricks. C. H. BREERWOOD. U. S. 1,380,701, June 7. Dolomite contg. a small amt. of Fe is ground very fine, burnt at a temp. sufficiently high to vitrify or amalgamate it, finely reground, compressed under high pressure and burned to form a vitrified brick adapted for lining kilns or steel furnaces.

45. Furnace linings. C. H. BREERWOOD. U. S. 1,380,700, June 7. A refractory material suitable for lining furnaces or for making crucibles is prepd. by introducing dolomite and Fe or similar material adapted to form a sinter in a finely divided condition into a furnace, mixing with it small pieces of coal tar, Fe, fire brick or other material to which the finely divided material adheres in its passage through the furnace to form balls, and continuing the heating for a sufficient time to aggregate the materials to the desired extent.

46. Electric furnaces. MORGAN CRUCIBLE CO., LTD AND C. W. SPIERS. Brit. 162,246, Oct. 7, 1919. Resistance tubes or crucibles are sepd. from a refractory outer wall by natural graphite in the form of flakes, which may be got by grinding the graphite and freeing it from dust; graphite of high C content should be used. Such flaky graphite, if loosely packed, has low elec. and thermal conductivity and is sufficiently elastic to allow expansion and contraction of the crucible, etc. Around the cooler part of the crucible, from the bottom terminal to a point within the casing, there may be placed a fine powder, such as sand or finely ground earthenware, to insulate the graphite from the terminal.

47. Automatic temperature control device for electric furnaces. A. L. WILKES. U. S. 1,377,952, May 10.

48. Electric resistances. W. TRAVIS, T. H. WATSON AND CO., LTD. Brit. 163,727, Aug. 13, 1919. A resistance for an elec. furnace is protected against oxidation by a casing consisting of bonded and fired SiC or of fused Al_2O_3. The core may consist of a series of disks, plates, rings, etc., or powder or granules, of amorphous or graphitic C or carbonaceous material. It may be placed in a mold and a mixt. of powdered or granular carborundum and clay rammed around it. Heat may then be applied externally, or elec. current passed through the resistance, to form it into a solid mass. The mixt. may alternatively be applied as a paste, or may be separately molded to form the casing. (*C. A.*)

49. Refractory composition. H. H. BUCKMAN and G. A. PRITCHARD. U. S. 1,375,077, Apr. 19. In the prepn. of refractory articles such as furnace linings, muffles or the like, zircon is used with a clay binder.

50. Refractory material. M. L. HARTMANN. U. S. 1,376,091, Apr. 26. A refractory material is formed of carborundum with Zr silicate and Al silicate as bonding materials.

51. Refractory heat-insulating material. P. G. WILLETTS. U. S. 1,374,538, Apr. 12. A refractory material adapted for boiler settings or the like is formed by burning a mixt. of finely divided lignite coal and plastic fire clay having a high silica content.

See Abstract No. 25.
See Abstract No. 103.

Abrasives

52. Manufacture and use of coated abrasives. L. S. GREENLEAF. *Tech. Eng. News*, **2**, 116–17(1921). ED.

53. Artificial corundum. ANON. *Tonind. Ztg.*, **45,** 1135–36(1921).—In 1894 E. Moyat first made artificial corundum for the firm of Mayer and Schmidt. This mat. was free from many defects of the natural corundum and soon became widely used as an abrasive. About the same time Acheson discovered carborundum which also became popular as a refractory. The Moyat process for the manuf. of artificial corundum (Ger. pat. 85,021, 1896, class 12) was based upon the elec. melting of emery, bauxite, etc. and the reduction of impurities as Fe_2O_3, SiO_2 and TiO_2 with coal or charcoal. Al_2O_3 is not reduced by this process while the impurities are and as a result the impurities are reduced, float to the top and are easily picked off. The purified Al_2O_3 crysts. to brown to ruby crystals on cooling. During the war the production of this mat. became an important industry in Germany where it is known as "corraffin." H. G. SCHURECHT

See Abstract No. 119.

Stoneware, Whiteware and Porcelain

54. A method of determining the tensile stregth of porcelain. F. H. RIDDLE AND J. S. LAIRD. *Proc. A. S. T. M.*, **21,** 1050–56(1921).—Test specimens of two types, one with conical ends or shoulders, the other dumb-bell shaped, having cross-sections of 0.125–0.2 sq. in., were tested in an ordinary 2000-lb. Olsen cement testing machine provided with special grips. The specimens were prepd. by pugging and extruding rolls of suitable size, throwing rolls by hand, and by cutting large pugged and cast blocks. Different strengths were found for specimens prepd. in different ways and for comparative tests the specimens must be prepd. in a uniform manner. The specimens were glazed and burned in regular porcelain kilns. Warped specimens gave unreliable results. It was found that good triaxial porcelain has a tensile strength of 3000–6000 lbs. per sq. in., calculated from the breaking strength of specimens 0.4 in. diam. Special high temp. porcelains show strengths up to 10,000 to 12,000 lbs. per sq. in. It was found that the tensile strength is a function of the diam. and cross-section of the test specimen. Plotting breaking strengths against diam. of test specimens gives practically a straight line, expressed by the equation $S_1 = (d_1 - 1/4)\ \frac{S_2}{d_2 - 1/4}$, where S_1 = strength of specimen; d_1 = diam. of specimen; S_2 = strength of small test specimen; and d_2 = diam. of small test specimen. E. N. BUNTING

55. The firing of stoneware. S. E. *Keram. Rundschau.*, **29,** 401–402 (1921).—When CaO is present in stoneware bodies Ca compds. of low viscosity are formed and hence the bodies may deform easily at high temps. Mg compds. are more viscous and hence bodies contg. Mg do not deform as easily as those contg. Ca. For this reason bodies contg. considerable CaO can not be fired above cone 4*a*, while stoneware contg. feldspar instead can be fired to cone 9 or 10 without danger of warping. Stoneware clays should vitrify between cone 07*a* and 4*a*. The glaze should have a softening point

between cones 01*a* and 05*a* and should be basic or neutral. The basic glazes are not affected by sulphates as the acid are. It is advisable to avoid the use of fuel containing sulphates since sulpho silicates are formed with them causing the glaze to become dull. Finishing the burn with wood fuel instead of coal will remedy to some extent the ill effects of sulphates. H. G. SCHURECHT

56. Some unsolved problems in potting. ASHLEY MYOTT. *Trans. Cer. Soc.*, **20,** 39–46 (Presidential address).—Suggests need for more uniform quality in raw materials, for some new type of filter press pump that would give continuous pressure, and for standardization of cylinder grinding. Suggests the use of producer gas and fuel oil for firing, the reuse of old plaster, the development of an automatic casting process for cups, etc., the publication of an elementary treatise on firing, the printing of underglaze colors, the introd. of a size for lithography which can be gilded upon without defects becoming apparent on the gilt decoration, and the more general use of mech. transport. States that in his own plant the loss between clay shop and packing room has never been less than 16%, exclusive of seconds and thirds.

H. F. S.

57. Recent visit to some Spanish and Portuguese potteries. W. LINDLEY. *Trans. Cer. Soc.*, **20,** 72–82.—In the large pottery of Gilman, Ltd., located at Sacovem and devoted to making whiteware, neither flint nor Carnish stone are used, the body consisting of silica sand, feldspar and a very slight admixt. of china clay and ball clay. Practically all the ware has been fired for the last 10 yrs. in a car-tunnel kiln of the Faugeron type. This kiln has no muffle and the ware is fired in saggers with the use of wood as fuel, which seems especially suitable for this type of kiln. The kiln is 275 ft. long. A temp. of 1150°C is used for biscuit and 1050°C for glass. Saggers do not last as long in the tunnel kiln as in beehive kilns. The underglaze printed patterns were not "hardened on" but the oil was neutralized by the use of weak sulphuric acid. A leadless glaze was used with very good results. Tiles to be glazed were placed on a traveling belt which carried them under a coating roller which imparted just the requisite amount of glaze without smearing the sides. A "climax" kiln has been used as long as 15 months before having to be shut down for repairs. H. F. S.

58. Effect of calcination of flints on earthenware bodies. A. HEATH AND A. LEESE. *Trans. Cer. Soc.*, **20,** 121–126.—Keeping the wt. per pint of slop flint the same, the wt. of dry flint content may vary 12.8 %. This is due to the fact that the sp. gr. of the flint may vary from 2.6 to 2.2, according to the degree of calcination. When sand is used in pottery making in place of calcined flint, the biscuit firing must be carried to a higher temp.

H. F. S.

59. Thorpe's solubility ratio. J. W. MELLOR. *Trans. Cer. Soc.*, **20,** 120.—T. E. Thorpe proposed an empirical rule which gives a fair indication whether a lead frit is likely to have a low soly. The rule should read

$$\frac{\text{Sum of bases (including alumina)}}{\text{Sum of acids}} = 0.5 \text{ approx.}$$

where molecular proportions (bases unity) are understood. Thorpe's suggestion that the number be multiplied by the mol. wt. of lead oxide and divided by the mol. wt. of silica is quite arbitrary and unnecessary.

H. F. S.

60. Some notes on saggers. B. J. MOORE. *Trans. Cer. Soc.*, **20**, 93–104.—Carborundum used as grog gave saggers with long life. The objections to the use of such saggers were: excessive cost, development of small cracks in the first firing, and excessive boiling when used with clays containing pyrites. They give better results in oxidizing than in reducing kiln atms. The author has used fused quartz, costing 50s per ton, as grog on a factory scale with great success. The clays used have been mixtures of ball and china clay, the relative percentages depending on the temperature. Saggers containing fused quartz as grog have a dull ring but do not dunt. The duller the ring, the longer they last. They do not stand rough handling well. Used in china biscuit oven, they have stood over 70 firings. H. F. S.

61. Further recent improvements in Swedish potteries. A. S. W. ODELBERG. *Trans. Cer. Soc.*, **20**, 47–55.—A lecture, illusd. by moving pictures, covering equipment discussed in a former article (cf. *These Abs.*, **1**, 12). New points are: all china clay used is imported from England. Cylinder grinding has been employed for 30 yrs. Biscuit ovens are fired $^2/_3$ with coal and $^1/_3$ with wood. Wood alone could be used but the cost for labor would be higher, the flame would be reducing and the life of the saggers shorter. The kiln bats used in the enamel oven are made of fire clay while those generally used in Staffordshire are made of iron. During the summer saggers are dried in open sheds. H. F. S.

62. Stoneware machines, pumps and exhausters. FR. MÜLLER. Friedrichsfeld. *Z. angew. Chem.*, **34**, Aufsatzteil, 291–2(1921).—A general paper read at the meeting of the Ger. Chem. Soc. in Stuttgart. J. H. MOORE (*C. A.*)

63. Moissen porcelain for pottery and chemical ware. W. FUNK. *Z. angew. Chem.*, **34**, Aufsatzteil, 127–8(1921).—Klein (cf. *C. A.*, **11**, 287) concluded from a microscopic study that Royal Meissen porcelain was burned at a comparatively low temp. or heat treatment. Funk claims this to be erroneous.

C. H. KERR (*C. A.*)

PATENT

64. Manufacture of hard porcelain for chemical and electrical purposes, etc. OTOGORÔ UMEDA. Japan 37,175, Sept. 28, 1920. Minerals partly or mainly composed of $MgSiO_3$, whose hardness is above 4, *e. g.*, enstatite, diopside, tremolite, jade, forsterite, serpentine, are mixed with clay of high purity. The operation is conducted as usual. (*C. A.*)

See Abstract No. 23.

Glass

65. Stained and painted glass. C. J. CONNICK. *Tech. Eng. News.*, **2**, 107–108(1921). ED.

66. The Canadian glass industry. ANON. *Can. Ind. of Chem.*, **V**, 315(1921).—The products of the Canadian glass industry in 1918 were valued at the

factories at $6,578,602, while imports into Canada for 1918 of glass and glassware were valued at $5,430,873, exports amounting to $35,267. Nine plants were engaged in the manuf. of glass and glassware in Canada in 1918, with a total working capital invested of $7,443,525. The industry employed 2,215 workers. The industry used $2,056,739 of materials during the year, of which the chief items were: soda ash $635,068; limestone $18,076; lime $18,046; litharge and red head $17,764; arsenic (white) $8,694; boxes and cases $367,946. The production of the industry included lamp and lantern chimneys, tumblers, bottles, and other pressed and blown glassware made by six firms; phials and chem. glassware by two others; and window glass by 1 firm only. Of the glass imports the largest item is for common and colorless window glass $1,809,031; plate glass $1,031,440; carboys, decanters, flasks, jars and phials, $657,113.

ED.

67. The manufacture of constructional glass in the United States. E. WARD TILLOTSON, JR. *J. Soc. Chem. Ind.*, **40,** 155–9T(1921); *Nat. Glass Budget*, **37,** No. 16, 1–7(1921).—Descriptive of the Lubbers and Colburn processes for the mechanical production of window glass, and of the manuf. of plate, wire, and miscellaneous sheet glass. At present about $^1/_3$ of American window glass is still hand made. The Colburn machine is producing about $^1/_4$ of the total window glass requirements. By this method sheets of any thickness up to $^1/_4$" can be drawn continuously, and it becomes a competitor in the plate glass industry as well as in the window glass. J. B. PATCH (*C. A.*)

68. The manufacture of iridescent glass. OTTO WILHELM. *Diamant*, **42,** 601–602, 619–20(1920); *Glass Industry*, **2,** 85–6(1921).—Glass may be made iridescent by either the wet or dry method. The former procedure subjects the glass to the action of 20% HCl at 120° under a pressure of 5 atms. In the dry method the glass is heated in a muffle and exposed to vapors of Sn chloride mixed with carbonates and nitrates of Sr, Ba and Cu according to the effect desired. Soft Pb and Na glasses give the best results.

J. B. PATCH (*C. A.*)

69. A new method of coating pearl beads. O. PARKERT. *Sprechsaal*, **52,** 23, 191(1919); *J. Soc. Glass Tech.*, **4,** 25–6.—Older methods of coating "pearl" beads were unsatisfactory on account of the ease with which the coating was rubbed off. Better results were obtained by coating the beads with hard varnish contg. the "fish silver," but the surface lacked the brilliance of the fire-polished glass. The present process suggested a method for producing the coating on the inside of the beads, thus being protected from abrasion. In the new method, a soln. was prepd. from dry "fish silver," copal varnish, mastic and acetone, possessing the property of rapid drying. The crystal glass beads were cleaned thoroughly with soda and dried. They were then placed in a glass bowl, so arranged and mounted that it could be rotated rapidly about an inclined axis. A portion of the soln. as above was added, the container closed by a rubber cover, and then rotated. After a short period the interior of the glass "pearls" was found to be coated evenly and regularly with the pearl silver, but the excess soln. was contained in the interior of the

beads as drops of liquid. To remove this, the cover of the vessel was taken off and the speed of rotation doubled, the vessel being gently warmed by a small flame. In a short time the liquid was evapd., and the coating adhered firmly to the inside of the beads. Aniline colors and lusters could be applied as interior coatings to beads in a similar manner. Cf. *C. A.*, **15,** 1976.

H. G. (*C. A.*)

70. The causes of loss in bottles during pasteurization and sterilization. A. W. BITTING. *Glass Industry,* **2,** 171(1921); *Glassworker,* **40,** No. 39, 21 (1921).—Mfrs. reported losses ranging from 0.1 or 0.2 to 3%. The Research Dept. of the Glass Container Association made tests on bottles of various sizes from 4 to 64 ounces capacity. The amount of head space or excess volume over rated capacity was found to vary disproportionately. With the smaller bottles the head space was about 12% of the total capacity, but with the 64-ounce bottles the head space was less than 5%. This extra vol. should be made dependent upon the expansion of the materials used where the containers are to be subjected to heat. The bottles were filled with tap water at a temp. of 60°F. When they were heated to a temp. of 100° the water had expanded 0.7%; 140°, 1.5%; 180°, 2.6%; 190°, 3.0%. The breakage was found to be much less in the case of the small bottles owing not only to the lower pressure generated (because of the relatively larger head space) but also to the fact that small bottles are inherently stronger than large ones. Tap water containing air gave a different result from boiled water. This would indicate a difference in pressure generated between processing cold fruit juices and those which had been previously heated in a kettle. It was recommended that bottles be preheated to 120°F or more before capping. J. B. PATCH (*C. A.*)

71. Some calculations of glass technology. J. B. KRAK. *Glass Industry,* **2,** 159–60(1921).—Very clear directions are given for figuring a batch from a glass analysis and *vice versa*. A useful table of factors is appended.

J. B. PATCH (*C. A.*)

72. Heat transfer in tanks. HENRY W. SELDON. *Nat. Glass Budget,* **37,** No. 10, 1–5(1921).—A disscussion of the combustion of producer and coke-oven gases, and of flame temp. J. B. PATCH (*C. A.*)

73. German sources of silica useful in the glass industry. HUGO KÜHL. *Gashütte,* **51,** 340–1, 389(1921).—K. gives 77 locations and analyses.

J. B. PATCH (*C. A.*)

74. New method of setting regenerator chambers. G. SUCHY. *Sprechsaal,* **52,** 247(1919); *J. Soc. Glass Tech.,* **4,** 165–6.—S. continued a discussion on the subject of regenerator chambers in which the checker work was built up on a series of carriages which could be withdrawn and replaced at will. The idea was not new but had never met with general acceptance. In the usual type of furnace—if the dampers were closed during filling-in and correctly regulated during founding, so as to avoid excessive draught—batch dust would not be drawn into the regenerators, and their subsequent stopping up or collapse would be hindered to such an extent that resetting should not be necessary for 1 to $1^1/_2$ yrs. After this period the regenerators should be

reset entirely. In a tank furnace conditions were different. Batch was filled in at hourly intervals and dampers were rarely altered, so that much more batch dust was drawn into the regenerators. The "new" system might be of advantage under these conditions, but as the chambers would have to be reset along their length the process would be very disagreeable. Glass from the siege could be prevented from leaking into the regenerators to a great extent by paying particular attention to the covering of the chambers. As the furnace grew older, however, cracks developed, and some glass frequently found a way into the chambers. To avoid this as far as possible, the following procedure was recommended. Before the first pot setting rake over the siege a dry mixt. of $^2/_3$ quartz sand and $^1/_3$ plastic clay to fill up all cracks. At each subsequent pot setting fill up all cracks or channels with the same mixt. made into a slip with water, and then cover with a liberal coating of sand. In this way the siege remained intact, and glass could not leak through. Soft glasses, such as the more fusible lime-soda glasses, could usually be made in furnaces depending chiefly on top heating, but for harder glasses, such as Bohemian crystal, bottom heat was essential. This could be attained by correct furnace practice. For instance, in the improved Siebert furnace, where the regenerators were close under the furnace, so soon as the second filling-in had melted down, the dampers should be lowered. The heat was driven upwards from regenerators and under-furnace, and the flames became clearer, and a steady, successful found resulted. Overflowing from the glass pocket into the chambers could be prevented by closing the pocket with a fire-clay stopper luted lightly with fire clay. When the glass pocket became too full, the fluid glass forced out the stopper and flowed into a special pit, thus obviating the arduous work of drawing the glass from the pocket. S. agreed that elliptical regenerator blocks were preferable to the ordinary form, but from experience preferred blocks 32 × 10 × 10 cm., on the ground that they distributed the heat more uniformly throughout the chambers.

H. G. (*C. A.*)

75. The new method of setting regenerator chambers. J. BALDERMANN. *Sprechsaal*, **52**, 363(1919); *J. Soc. Glass Tech.*, **4**, 166.—B. maintained that the system of setting regenerator chambers by means of movable carriages had proved efficient in practice. For each chamber 3 carriages were necessary, and all 4 chambers could be reset in 2 to 3 hrs., whereas in the case of badly fused chambers it took from 48 to 60 hrs. to put these into good order by the older method. With regard to other points raised in the discussion, the siege of the furnace could be maintained in much better condition by the use of grog than by using the sand-clay mixt. recommended by Suchy (preceding abst.), since well burned grog was not so readily attacked by the overflowing glass as were sand and clay, and consequently remained permanent, whereas sand and clay were dissolved by the glass, leaving exposed cracks and channels in the siege. Further, the pots did not bind so firmly to the siege when set on coarse grog as when sand is used. In a furnace with top-flame heating it was quite possible to melt a glass contg. 30 parts of soda to 100 parts of sand, or

even somewhat harder. The harder the glass the cheaper it was and the better the color. B. pointed out that if the dampers were closed during filling in the result would be that the flame would be driven out through the filling-in holes. He approved the idea of the automatic emptying of the glass pocket, but it remained to be seen whether this would work out well in practice.

H. G. (*C. A.*)

76. The simplex muffle leer. C. E. FRAZIER. *Nat. Glass Budget*, No. **2**, 1(1919–20); *J. Soc. Glass Tech.*, **3**, 267–9(1919); 2 figs.—The advantages of muffle *vs.* open leers are enumerated. The Simplex muffle leer is an improvement over other muffle leers owing chiefly to a flat rather than a curved arch. This construction is made possible by use of a cast iron support for the tiles so that each tile has only its own weight to support, reducing breakage and by making thinner walls possible increasing the amount of radiation and thereby the efficiency of the leer.

J. B. PATCH (*C. A.*)

77. Furnace for revolving pots. ANON. *Nat. Glass Budget*, **37**, No. 21, 1–2(1921).—A description of a test of a Chapman-Stein recuperator applied to an Owens revolving pot. The temp. of the waste gases entering the recuperator was 1550°F. The temp. of the air coming from the recupe ator was 1300°F. The temp. of the gases entering the stack was 650°F. If the distance between the furnace and recuperator had been less the initial temp. of the waste gases would have been higher; nevertheless the figures show the efficient transfer of heat of the waste gases to the incoming air. The recuperator is said to be capable of maintaining a very const. temp. For 24 hours the temp. readings of the furnace showed a max. variation of 40° F from the mean temp. However, this is not nearly as close a regulation as is possible and not even as close as the engineers guarantee. In another test under different circumstances a max. variation of ±10°F was obtained. The Stein recuperator is said to be especially valuable in connection with pot furnaces. In Europe it has not only reduced the fuel consumption of such furnaces nearly ½ but it has also nearly doubled the av. life of the pots.

J. B. P. (*C. A.*)

78. The Mathews reverberatory furnace. ANON. *Nat. Glass Budget*, **37**, No. 18, 1, 20–21(1921).—A detailed description without diagrams of a recuperative gas-fired pot furnace, largely in the language of the patent.

J. B. PATCH (*C. A.*)

79. Comparative strength of prescription bottles. A. W. BITTING. *Glass Ind.*, **2**, 187(1921).—The results of tests upon 28 sizes and types of prescription ware of ½ to 16 oz. capacity are tabulated. The data include height, cross-section, cubic displacement, weight, capacity, ratio of wt. to capacity, vertical resistance, lateral resist., hydrostatic resistance, impact resistance, max. and min. thickness. In the strength tests, the round bottles were the best except that the panel shaped bottles had the highest resist. to lateral pressure. The sq. bottles were among the weakest in all tests except in the resistance to hydrostatic or internal bursting pressure in which the ovals were the poorest. Classed as to size the large bottles offered the best resist. to vertical pressures

and the small bottles to hydrostatic pressure. The lateral and impact resist. were very uniform for all sizes. All of the bottles tested were the product of one firm. J. B. PATCH (*C. A.*)

80. Flask calibrating and marking device. G. L. SPENCER. *J. Ind. Eng. Chem.*, **13,** 1058–9(1921); 1 cut.—The meniscus is accurately located by means of a pair of Pt electrodes, which extend into the flask to just above the surface of the distd. water. The latter, slightly acidified with H_2SO_4, is measured into the flask with a calibrated burette. The visible or audible evolution of gases at the surface indicates the point of contact. A graving tool whose point has previously been aligned with the bottom of the central electrode is revolved about an axis in line with the center of the flask, cutting a ring in the wax coating. A 1. flask with a neck 20 mm. in diam. can be graduated to 0.02 cc., the limit of accuracy of the burette. Results are given for a series of flasks so graduated. T. F. BUEHRER (*C. A.*)

81. Annealing of glassware—past, present, future. E. E. MILNER. *Nat. Glass Budget*, **37,** No. 28, 1–4(1921); 7 illus.—Historical and descriptive of the Dixon muffle leer. The muffle chamber is made up of 10 flue units, the first 4 in front being heated by the initial combustion of gases and the 6 rear flues utilizing the waste heat from the front flues. Leers up to 20 ft. in width are made to compare favorably in temp. distribution and fuel consumption with those of less than half that width. This is accomplished by narrowing the flue areas, thus increasing the velocity of gases and flame length. Provision is made for the introduction of elec. heating elements into these flues, this being the annealing method of the future. The following temps. are given as being typical in the case of machine-made fruit jars: Tank furnace 2200° F, mold 600°F, plunger 800°F, outer surface of jar as taken from mold 600°F, inner surface 700°F, interior of thick wall or bottom 1400°F. To relieve the strains set up by these varying temps. 1050°F is given as a suitable leer temp. No cooling rate is given. The Dixon Strain Finder is briefly discussed with illus. J. B. PATCH (*C. A.*)

82. Influence of silica on the annealing temperature of glass. S. ENGLISH, F. W. HODKIN, C. M. M. MUIRHEAD AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **4,** 387–91(1920).—S series of simple Na silicate glasses ranging from $2Na_2O.4SiO_2$ to $2Na_2O.10SiO_2$ was examd. The upper annealing temp. was found to rise with increase of silica content, the rate of increase being most rapid between $2Na_2O.4SiO_2$ and $2Na_2O.7SiO_2$. J. S. C. I.

83. The effects of treating glass surfaces with certain lubricants. W. SHACKLETON. *Trans. Optical Soc.*, **20,** 155(1919); *J. Soc. Glass Tech.*, **3,** 253.—Tests were made with 3 lubricants, namely, Lasin, Everclear, and Nepheless, in order to det. which was the most effective in preventing "steaming" of the glass surface. The temp. at which the untreated glass was obscured was 19°, and this was reduced to −6°, −8°, and −10°, resp., after the lubricant had been applied. Nepheless, a prepn. made by S., consisted of glycerol with 20% of Na stearate added. H. G. (*C. A.*)

84. The composition of opaque glasses. J. B. KRAK. *Glass Industry*, **2**, 81–4(1920).—An account of the development of glasses for illuminating purposes. Such glass is like snow, colorless in itself but appearing white owing to the reflection and diffusion of light from innumerable small colorless particles. A number of methods for introducing these small particles into the glass have been and are in use. Alabaster and phosphate glasses are the oldest types and more recently the opacity has been produced with aid of fluorides. A list of opacifiers includes Mg silicates such as talcum and asbestos, phosphates such as bone ash, calcined guano and Na phosphate, fluorides such as Na and Ca fluorides, lepidolite, cryolite and fluorsilicates. With fluorides are used feldspar, china clay, Al_2L_3 or $Al(OH)_3$. Occasionally oxides of Sn, Ti or Zr are used. Auxiliaries are As and Sb, NaCl and $Na_2B_4O_7$, alkali and alkaline earth sulfates. Definite knowledge of the exact cause of the opacity is lacking. Various investigators have ascribed it to devitrification, imprisoned bubbles of gas or to a solid emulsion, and to colloidal particles in suspension as in a pigment. Several old batches and recent patents are included in the article. J. B. PATCH (*C. A.*)

85. Milk or alabaster glass. ASHER BLUM. *Glass Industry*, **2**, 84–5(1921).—A summary of 17 foreign and domestic patents for illuminating glassware. J. B. PATCH (*C. A.*)

86. Development of the glass industry. ALEXANDER SILVERMAN. *Glass Industry*, **2**, 92(1921).—Review. J. B. PATCH (*C. A.*)

87. Notes on glass cutting. ANON. *Diamant*, **42**, 658(1920); *Glass Industry*, **2**, 90(1921). J. B. PATCH (*C. A.*)

88. Ultraviolet and visible transmission of various colored glasses. K. S. GIBSON, E. P. T. TYNDALL, AND H. J. MCNICHOLAS. Bur. Standards, *Tech. Papers*, No. **148**, 27 pp.(1920); *Science Abstracts*, **24A**, 179; cf. *Jour. Am. Ceram. Soc.*, **3**, 338; *C. A.*, **14**, 457.—The paper summarizes investigations on 87 samples of glass, mostly colored. Spectral transmission curves extending from about 710 $\mu\mu$ throughout the visible and ultraviolet as far as any appreciable transmission is evident, are presented. The authors also give a chart connecting thickness of material and transmission. Among the uses to which such glasses may be put are ultraviolet signalling, railway signalling, improvement of visibility (both visual and photographic), eye-protection, selective filters. Photographic, photoelec., and visual methods are described. Photographic detns. were made with the Hilger sector-photometer and a quartz spectrograph. The visual data were obtained mainly with the König-Martens spectrophotometer. In an appendix some particulars of precautions necessary in obtaining data on the ultraviolet region are given and some spectrophotographs showing the effect of various solns. are included. H. G. (*C. A.*)

89. Colored glass batches. ANON. *Glasind.*, **31**, 217–8, 225–6, 233–4, 289, 297–8, 305–6(1920).—Ninety-five batches for colored glasses of many varieties are given. Cf. *C. A.*, **15**, 154. J. B. PATCH (*C. A.*)

90. Glass cutting. M. PINK. *Glasind.*, **31,** 313–4, 321–2, 329–30, 337–8, 345–6, 353–4, 367–73(1920).—Detailed instructions are given for cutting sheet glass of all kinds, chiefly with the diamond. Cf. Notes on Glass Cutting, *Glass Industry*, **2,** 90(1921); *Diamant*, **42,** 658(1920). J. B. PATCH (*C. A.*)

91. Gypsum as a substitute for limestone in the glass batch. R. *Glasind.*, **32,** 325–6(1921).—This substitution is not recommended.

J. B. PATCH (*C. A.*)

92. The smoke nuisance in glass melting. LUDWIG SPRINGER. *Glashütte*, **51,** 355–6, 371–2, 387–8, 403–4(1921).—A summary of the subject concluded by a personal experience of the author. A glass factory with a 45-m. stack was 150 m. from a forest. Neither SO_3- nor F-containing compds. were used in the batch. The fuel was coal and briquets in which a later test indicated a content of 2.0 and 1.0% respectively of volatile S. After 6 years of operation damage to the vegetation was evident in the path of the smoke from the stack. No change had been made in the fuel. Analyses of the ash of damaged and unaffected vegetation showed SO_3 to the extent of 0.19–0.20% in the latter while the former ranged from 0.30 to 0.51%.

J. B. PATCH (*C. A.*)

93. The firing of painted glass. F. HUTH. *Diamant*, **40,** 43, 57(1918); *J. Soc. Glass Tech.*, **4,** 140(1920).—Every mixture used for glass painting consisted essentially of a coloring substance and a fluxing agent, the latter effecting the combination of the former with the surface layer of the glass during the firing process. These mixts. were divided into two classes: (1) those in which coloring oxides were mixed with the flux immediately before use, and (2) the so-called "glass-painters' fluxes," in which the oxide was already united with the fluxing medium to form a glassy body, this being pulverized and mixed with oil for application to the glass. In order to prevent the furnace gases from coming into contact with the painted glass, the object to be fired was put into a muffle, and this inside the furnace. The muffle might be iron or fireclay, iron muffles being used for colors which were to be fired at a relatively low temp. The fireclay ensured a more uniform temp. throughout the interior of the muffle, and, therefore, was always used when great heat had to be applied. When the muffle was in the furnace, which might be heated by burning fuel inside it, the temp. was slowly increased, and the easily melted flux and the surface layer of glass combined and took up the coloring oxide. When this was accomplished the temp. must be very slowly lowered or the glass would crack. In practice, test-pieces were put into the muffle with the decorated object, the furnace was run for about three days, and then the test-piece examd. If the firing was complete, the fuel was removed from the furnace, which was closed up and allowed to cool for a further three days before being opened. The firing might have to be repeated two or three times, in which case the second coloring mixt. must contain more flux than the first. The repetition of the firing was a delicate process requiring careful handling.

J. B. PATCH (*C. A.*)

94. Machine-drawing of glass tubing. J. F. SPRINGER. *Glass Industry*,

2, 110–12, 138–40(1921); illus.—A detailed description of the Edward Danner tube-drawing machine as operated by the Kimble Glass Co. of Vineland, N. J. J. B. PATCH (*C. A.*)

95. Novel method of handling molten glass. ANON. *Glass Industry,* **2,** 142(1921).—Molten glass can be drained from tanks through a 1″ hole on to a 40′ steel pan conveyor on which water is sprayed. This delivers the glass to another belt conveyor similarly equipped with water on which a canvas belt impregnated with rubber has been used successfully. Saving of time and labor is effected and the glass is very conveniently broken up. J. B. PATCH (*C. A.*)

96. The alkalimetric testing of glassware. F. MYLIUS. *Z. angew. Chem.,* **34,** Aufsatzteil, 281–4(1921).—A paper on the eosin reaction. Cf. *C. A.,* **2,** 450; **4,** 2557; **8,** 1000. J. B. PATCH (*C. A.*)

97. The pot and block room. P. K. EDUARD SCHNURPFEIL. *Glas-industrie,* **32,** 169–70, 181–4(1921).—The manuf. of pots, boots, rings and tank blocks is discussed in considerable detail. Dimensions and 8 recipes are given. The casting of pots is briefly mentioned. J. B. PATCH (*C. A.*)

98. Ten years of glass machinery manufacture. ANON. *Glassworker,* **40,** No. 32(1921); illus.—Historical account of the machinery of Wm. J. Miller of Swissvale, Pa. J. B. PATCH (*C. A.*)

99. Double refraction and crystalline structure of silica glass. LORD RAYLEIGH. *Proc. Roy. Soc.,* **98A,** 284–96(1920); cf. *C. A.,* **14,** 327, 604.—Silica glass when examd. with a special polariscope shows double refraction which is due not to stress but to a cryst. structure. This double refraction is of the order of magnitude of one-sixtieth that of cryst. quartz, and usually appears as a structure of doubly refracting grains about one-half mm. in size with no regular orientation. If the grained material is drawn out while hot, the grains elongate into fibers following the course of the material, and show "straight extinction" in the polariscope, their length being along one axis of the ellipsoid of optical elasticity. Optical silica disks show a spiral structure. By heating and cooling such a disk the structure may be made to disappear and reappear. DONALD E. SHARP (*C. A.*)

100. The devitrification of glass. HARRISON W. CRAVER. *Diamant,* **42,** 379; *Glass Ind.,* **1,** 40(1920).—A brief description of the process of devitrification. DONALD E. SHARP (*C. A.*)

101. Use of light soda ash in the production of flint bottle glass. C. A. COLE. *Glass Ind.,* **1,** 34–8(1920).—Lime batch containing light soda ash may be melted in glass tanks without a tendency toward formation of scum or seeds if high temp. and uniform methods of feeding are employed. A melting temp. of 2450°F (1340°C) is recommended. Analysis of batch and resultant glass show that little alkali is lost in melting. DONALD E. SHARP (*C. A.*)

102. The occurrence of crust or scum on continuous bottle tank furnaces. WILBUR F. BROWN. *Glass Ind.,* **1,** 29–30(1920).—Crust or scum in the melting chamber of glass tanks is usually high in SiO_2 and Na_2O but low in CaO. The causes of its formation are, a "cool" tank, or a batch of too high SiO_2

or CaO content. It can best be removed by using a proper batch and maintaining high temps., not by adding the common fluxing materials. Analysis of two-typical scums are given. D. E. SHARP (*C. A.*)

103. New Bergman gas and air valve described. HENRY W. HESS. *Glassworker*, **40**, No. 51, 11(1921); 2 illus.—"This valve is unique and practical in that the gas and air are reversed by the same operation and simultaneously, either by hand or automatically, being controlled by clock work and motor or by a thermostat placed in the checker work of the regenerators. This latter is a most essential and valuable feature, and greatly facilitates the regulation of even temps." The valve is circular in shape, brick-lined, water sealed, and is divided into 6 segments. The duration of reversal is 10 seconds during which time the valve passes through an angle of 120°.

J. B. PATCH (*C. A.*)

104. The industry of silica glass. G. FLUSIN. *Chimie & industrie*, **5**, 119–35 (1921); cf. *Jour. Am. Ceram. Soc.*, **4**, 868(1921).—The manuf. of the opaque and semi-translucent varieties of quartz glass is discussed. By means of the heat developed by passing a heavy current through a graphite rod embedded in pure quartz sand in a furnace, a cylinder of semi-fused quartz is formed around the resistor. The temp. is raised to such a degree that the gases formed by interaction between the quartz and the graphite core sep. the tube of quartz from the core. The tube is then withdrawn from the furnace, freed from adhering sand, and formed by drawing, blowing in molds, pressing, etc., the operations being fairly easily performed once the initial resistance due to surface cooling has been overcome. The outer surfaces of the objects are sand-blasted to remove incompletely fused grains of sand. Semi-translucent ware is produced by severe sand blasting followed by treatment with HF, by forming the quartz cylinder inside a graphite cylinder so that the entire charge of sand is used and both surfaces are subjected to radiant heat, or better by reheating to the softening point. This last method results in a marked decrease in size of the bubbles which are largely responsible for the opacity. J. S. LAIRD (*C. A.*)

105. The industry of silica glass. GEORGE FLUSIN. *Chimie & industrie*, **5**, 257–70(1921); cf. preceding abstract.—The manuf. of transparent quartz is described. The raw material for this variety must be of the highest purity both to avoid the discoloration caused by foreign oxides and to prevent the evolution of bubbles from chemical action. Zirconium and silicon carbides in one of their several forms are the most satisfactory refractories to date. A number of ingenious methods for avoiding or getting rid of the air bubbles occluded in the melt are briefly mentioned and patent references given. The quantity of air entrapped in the quartz mass is greatly increased by an expansion in vol. of about 1% at a temp. of 575° caused by a change in the cryst. structure to the β quartz allotrope. Devitrification is a source of trouble and is reduced by complete freedom from bubbles and other impurities. A bibliography of 117 items is attached to the article. J. B. PATCH (*C. A.*)

106. Modern development in manufacture of building glass. ROBERT G. SKERRETT. *Compressed Air Mag.*, **26**, 10135–42(1921); *Glass Ind.*, **2**,

194–7(1921).—A descriptive article of modern processes with numerous first class illustrations. J. B. PATCH (*C. A.*)

107. The steam gage tube situation. J. F. SPRINGER. *Glass Ind.*, **2,** 183–7(1921); 3 illus.—A very complete description of the hand process of drawing glass tubing, and of the impossibility of attaining precision in the diam. and wall dimensions of drawn tubing. J. B. PATCH (*C. A.*)

108. The etching of flashed glasses. ERNST BEUTEL. *Glas-industrie,* **30,** 109–10(1919). J. B. PATCH (*C. A.*)

109. "Keramo." F. Z. *Glas-ind.*, **30,** 197–8(1919).—Descriptive of the French Garchey process for the manuf. of decorative building stones from glass. J. B. PATCH (*C. A.*)

110. Is there need for improved glass in preserve jars? H. THIENE. *Glas-industrie,* **30,** 101–3(1919).—T. demonstrates the need for better glass to withstand temp. changes and soly. Jena glass is recommended. J. B. PATCH (*C. A.*)

111. Development of various types of glass. C. J. PEDDLE. *J. Soc. Glass Tech.*, **4,** 299–366(1920).—The prepn., stability, and optical properties of the following series of alkali, PbO, silica glasses were studied: 100 SiO_2, 40 Na_2O, xPbO; 100 SiO_2, 20 Na_2O, xPbO; 100 SiO_2, 40 K_2O, xPbO; 100 SiO_2, 20 K_2O, xPbO; 100 SiO_2, 20 Na_2O, 20 K_2O, xPbO; 100 SiO_2, 10Na_2O, 10 K_2O, xPbO, where x varied from 5 to 40 mols. All the glasses can be founded above 1350° and exhibit corrosive action on pot clay, increasing with increased alkali content. Glasses of the soda series tend to devitrify if contg. more than 65% SiO_2, and those of the mixed alkali series if the silica content exceeds 61%. The potash glasses show no signs of devitrification, but all film badly on prolonged heating at 900°. In all cases density and refractive index increase with increasing content of PbO, the rate of increase falling as the PbO content rises. Dispersion also increases with increase of PbO, but ν falls as η_D rises. Comparison of the above and also of further series contg. equal percentage amts. of potash and soda showed all the soda glasses to have higher densities than the corresponding potash glasses, the mixed alkali glasses having intermediate values. In the equimol. series the potash glasses have slightly higher refractive index and total dispersion, but in the series contg. equal. wts. of alkali the soda series has higher refractive index and dispersion. The refractive index and dispersion of the mixed alkali series are intermediate between those of the soda and the potash series. The soly. of the glasses in water decreases as the content of PbO or silica rises but increases rapidly with increase of alkali. Soly. tests prove the following glasses to be of first-class durability for optical requirements: Glasses of the mol. formulas, 20 Na_2O, 30 PbO, 100 SiO_2; 20 Na_2O, 40 PbO, 100 SiO_2; 10 Na_2O, 10 K_2O, 30 PbO, 100 SiO_2; 10 Na_2O, 10 K_2O, 40 PbO, 100 SiO_2; 20 K_2O, 40 PbO, 100 SiO_2; also glasses of the percentage compns., SiO_2 50, Na_2O 10, PbO 40; SiO_2 50, K_2O 10, PbO 40; SiO_2 40, Na_2O 10, PbO 50; SiO_2 40, K_2O 10, PbO 50; SiO_2 60, Na_2O 5, K_2O 5, PbO 30; SiO_2 50, Na_2O 5, K_2O 5, PbO 40; SiO_2 40, Na_2O 5, K_2O 5, PbO 50. The first two of the mol. series approximate in optical consts. to well known Schott glasses.

The Benrath formula 6 SiO_2, 1 R_2O, 1 PbO does not give a very stable type of alkali-PbO-silica glass, a more satisfactory one being 5 SiO_2, 1 R_2O, 1.5 PbO. J. S. C. I.

PATENTS

112. Cleansing and polishing paste for glass. J. M. SCHWANER. U. S. 1,382,019, June 21. The mixt. is formed of whiting 58 lbs., powdered pumice 16 lbs., kerosene 19 lbs., Na_2CO_3 3 lbs., NaCl 3 lbs. and essential oils such as oils of citronella and geranium 2.5 oz. each. (*C. A.*)

113. Glass. E. C. SULLIVAN and W. C. TAYLOR. U. S. 1,369,988, Mar. 1. A glass adapted for *manuf. of elec. lamp bulbs* is formed of SiO_2, 62–79.4, Na_2O 16–23, MgO 1.6–15, CaO 0–8.8 and ZnO 0–3.1 parts. (*C. A.*)

114. Polish for glass or metals. H. SWANSON. U. S. 1,381,250, June 14. A mixt. adapted for polishing Ag, Au or glass is formed of H_2O 8 oz., naphtha soap 1.75 oz., pptd. $CaCO_3$ 4 oz., $NaHCO_3$ 0.15 and cream of tartar 0.24 part. (*C. A.*)

115. Finishing glass. L. SHOWERS. U. S. 1,373,532, Apr. 5. Smooth relatively opaque glass is polished with a polishing powder of about the same color as the glass with polishing devices maintained at such a temp. as to cause "burning" of the glass. A "soft" finish is thus formed on Carrara or other glass. (*C. A.*)

116. Apparatus for annealing glass or similar heat-treatments. D. E. GRAY. U. S. 1,372,420, Mar. 22. (*C. A.*)

117. Mirrors. C. L. TOMLINSON. Brit. 163,606, June 23, 1920. A glass mirror having a metallic reflecting surface embedded beneath its surface is made by depositing on a high-CaO glass Au, Ag, Pt, or Cu, and heating the glass for a short period in such a way that the surface only is caused to melt and absorb the deposit of metal. To form the metallic coating, dry chloride of Au, Ag, Pt, or Cu is mixed with oil of rosemary and made into a paste which is thinned with oil of lavender. The paste is applied to the polished surface of the glass, which is then heated sufficiently to evap. the oils. (*C. A.*)

118. Translucent antislipping tile. M. F. BEECHER. U. S. 1,374,136, Apr. 5. A safety tread material is formed of a translucent substance such as glass into which are fused particles of hard, wear-resisting, antislipping material such as cryst. Al_2O_3 granules. (*C. A.*)

119. "Antislipping tile." H. K. DODGE. U. S. 1,377,960, May 10. Tread blocks are formed of particles of cryst. Al_2O_3 or material of similar hardness constituting the major portion of the block, and a binder of vitrified ceramic material. *C. A.*

Enamels

120. Anti-corrosive chemical engineering plant. Pumps for corrosive liquids. ANON. Eng. Dept. Guthrie & Co. Accrington, Eng. *Canad. Chem. Met.*, **5**, 341–44(1921); *Engineering*, **110**, 253–54(1920).—Describes centrifugal pumps and other equipment lined with a new cer. acid and heat

resisting coating, called ceratherm, which resembles porcelain. The cer. lining is cast in the desired form and cemented into place with an acid proof cement. It is a good heat conductor, resists sudden temp. changes, has high tensile strength and is claimed to be superior to all other cer. coatings hitherto employed. ED.

121. Enameled steel manufacture. CHESTER H. JONES. *Chem. Met. Eng.*, **25,** 883–86(1921).—The enamel is prepd. and applied by both the wet and the dry process. There are in general 4 different coatings used depending upon the service to which the ware is to be subjected. One is supplied for the malt industry only; the dairy, soft drink and pharmaceutical trade use another type; the third enamel is designed to resist all and any degree of acidity, and finally a special coat is used which is more decorative and while not compounded to combat acid has a reasonable resist. to it. Raw mats. ordinarily used are ground sand, quartz, feldspar, borax, cryolite, fluorspar, sodium and potassium compounds and clay. The raw mats. for making the frit are mixed by hand or in revolving drums. Five Abbé pebble mills and 4 special rotary smelters comprize the glaze room app. Ordinarily wet enamels are sprayed on the heavy pieces through the medium of a portable air spray nozzle guided by the hand of the operator. Chem. plant ware may be treated by the dry process, or dusting. In this case the metal surface is wetted and the dry powdered frit dusted on where it adheres to the water film. The equipment for burning enamel to the steel consists of a total of 7 furnaces, 4 of which are the open type, 2 complete muffle type and 1 vertical furnace of special design used for firing small articles that would involve waste of heat if treated in the large furnaces. This furnace consumes oil for fuel, the remainder burning coke. Muffle furnaces are employed largely for burning light wares, especially the light enamels, while the heavier steel pieces are fired in the open type. The temps. range from 1,500° to 2,000°F. The temp. in any one firing depends on the enamel. Hoskins' pyrometers record the temps. of each furnace. Adjacent to each battery of furnaces is one enamel application room. The coated ring or tank is picked up by a traveling charging crane and placed in the open-type furnaces, where it is revolved on a turntable while burning. The muffle furnaces are served by power tongs, which pick the pieces from tables moving on industrial tracks along the front of the battery and place them within the burning chamber in each case. The special upright circular kiln is charged through split doors in the top and is equipped with two firing holes located in the side near the bottom. The waste gases from all furnaces is conducted through waste heat boilers in the power plant. H. F. S.

122. Enamel-lined apparatus. CHESTER H. JONES. *Chem. Met. Eng.*, **25,** 927–932(1921). General description of the plant of the Elyria Enameled Products Co., Elyria, O. (See preceding abstract).—The company makes 3 general grades of enamel (compns. not given) some of the uses of which are outlined in the following paragraphs. Enamel No. 11, which is applied to cast-iron ware, has been found to resist the action of inorganic acids such as

hydrochloric, nitric, phosphoric, sulphuric, hydrobromic, hydriodic, aqua regia at any strengths and any mixts. of these. It is acted upon by hydrofluoric acid of any strength. It resists action of stannic chloride in hydrochloric acid, zinc chloride up to 300°C, gaseous hydrochloric acid, aluminum chloride, bromine, chlorine, iodine (moist or dry), tungstic oxide precipitation by hydrochloric and nitric, sulphur dioxide, thorium nitrate in nitric acid, and manganese dioxide with hydrochloric acid. It may be used for all org. acids, acid chlorides and org. compds., being particularly resistant to acetic vapors. It is successful in vessels for heating magnesium hydroxide under pressure, for evapg. lime salts of sulphocarbolates or boiling sodium carbonate, for ammonia and sodium or potassium salts of inorg. comps., but is decomposed by caustic alkalies and is acted upon slightly by hot milk of lime. Sodium cyanide and similar salts are too alkaline and react with it. It is more resistant to alkalis than most enamels. Enamel No. 20, which is applied to steel, has been used successfully for all strengths of org. acids (hot or cold), ammonium sulphate, acetic anhydride, acetic acids of all strengths (but not vapors), brine, moist chlorine, hydrochloric acid in alcohol, hydriodic acid, lactic acid of all strengths (hot or cold), hot phenol, tin chloride plus 1% hydrochloric acid, zinc chloride soln., hot sulphur chloride, inorg. acids below 0.5% strength cold, sulphuric acid above 50% strength and mixed acids high in sulphuric acid, hot or cold. If the reagent is one which attacks iron severely, the enamel coat must be perfect, limiting the size to 600 gal. If there is no severe action on iron, any size up to 3,000 gal. can be had. The limiting size must be decided for each condition by itself. It is also used for hot carbonate, cold sodium hydroxide 10% and hot ammonia. Enamel No. 21, which is also applied to steel, is used for all conditions of milk, such as milk heating, holding, mixing, etc.; for oils, fats, alcoholic solutions of shellac, ammonia, aniline hydrochloride, acetic acid, storage cold; ammonium nitrate, bleach liquor, dry chlorine, dry hydrochloric acid gas, cold beverage sirups involving citric acid, grape juice, hydrogen peroxide, tincture of iodine, making invert sugar, hot oil of peppermint, cold phenol, salicylic acid and hot acetic anhydride, dry sulphur dioxide, tannic acid, hot bromine, distilled water, and hot fuming sulphuric. The last has been handled more successfully by No. 21 than by other enamels. For perfect coats the sizes are limited to 1,000 gal. Otherwise any size up to 7,000 gal. can be obtained. Here, as with No. 20, the limiting size can be detd. only after making a study of the case in hand. Cast iron units may be used with 75-lb. steam pressure in the jacket and up to 100 lb. inside the still. It has a coeff. of heat transmission about $^1/_4$ that of copper. With steam, temp. up to 160°C in the jacket can be obtained. Up to 225°C an oil jacket can be used. Superheated steam at 315°C has been used on the small units. The enameled units have also been heated by a direct, well-spread flame up to temperatures of 300°C, but such service is rather severe, limiting the life of the enamel. Steel units are usually heated by means of a steam jacket, the 500-gal. sizes permitting 30-lb. pressure, the large ones, such as 3,000 gal., being limited to 10-lb. pressure. The pressure within the tank may be $1^1/_2$ times as great as that in

the jacket. The coeff. of heat transmission is about $^1/_3$ that of copper, using straw as a heating medium. Using oil in the jacket (which has been done up to 250°C), the coeff. drops to $^1/_5$ that of copper. H. F. S.

123. Enameled Products Research Laboratory. EMERSON P. POSTE. *Chem. Met. Eng.*, **25,** 974(1921).—A detailed description of the research laboratory of the Elyria Enameled Products Co., Elyria, O. Facilities are provided for small-scale factory opern. expts. in cer. engineering, with special reference to enameling of metals, chem. engineering, and metallurgical engineering. An analytical dept. serves the 3 other depts. H. F. S.

124. The new Meurer enamel spraying process. ANON. *Glashütte*, **51,** 131–2, 147–8(1921); cf. *Jour. Am. Ceram. Soc.*, **4,** 787; *ibid.*, **4,** 1015; 1 fig.—A modification of the Schoop spraying gun or nozzle. J. B. PATCH (*C. A.*)

Heavy Clay Products

125. New method for drying clay. ANON. *Chem Met. Eng.*, **25,** 753 (1921).—Pottery plants at Devon and Cornwall, are now using a new method for drying clays, in which two metal drums are employed, one enclosed in the other. The inner drum is driven by mech. means, and while revolving, steam enters in at a few degrees above the temp. of boiling water. The clay is passed into the outer drum and comes into contact with the inner drum as it revolves, filled with steam. The water in the clay is evapd. and the clay dries quickly, the process being one measured in mins. H. F. S.

126. Some causes of the so-called disintegration of terra cotta brick, and allied ceramic materials and suggested remedies. H. A. PLUSCH. *N. J. Ceramist*, **1,** 65(1921).—Discussed under the following headings (1) high porosity of the body; (2) high silica content of the body; (3) the effect of soluble salts; (4) poor workmanship; (5) lack of mortar in joints and poor mortar; (6) uneven thickness of ware; (7) effect of the sun and frost; (8) settlement of buildings. C. W. PARMELEE

127. A note on body cracking of terra cotta. E. C. HILL. *New Jersey Ceramist*, **1,** 70(1921).—The author concludes that fire cracking may not be due to variations in the firing temp.; that it seems possible to crack a body of almost any compn. by too rapid cooling; that a considerable range of compn. is possible in bodies without producing fire cracking, if the pieces are cooled slowly; dense bodies are more sensitive, therefore the use of grog of suitable size and quantity is advisable; the greater the amount of sandy clays used the greater the contraction between 650° and 850°; the most effective prevention is slow cooling at the lower temps. particularly from 650° to 500°C. C. W. PARMELEE

128. Building blocks made from boiler scale. KOCH. *Tonind. Ztg.*, **44,** 360; **47,** 387, 388(1921).—A factory has been started at Eberfeld to manuf. cheap building blocks for workmen's dwellings from a slime obtained by digesting the slag produced by the municipal gas plant. They claim to have a capacity of $2^1/_2$ million blocks per annum, and to produce building blocks at low fuel cost. WM. M. CLARK

129. Report of Committee C-3 on brick. H. T. SHELLEY AND WARREN E. EMLEY. *Proc. A. S. T. M.*, **21,** 284(1921).—*Cement brick* has been included in the committee's activities. The committee recommendations on specifications for sewer brick follow. ED.

130. Tentative specifications for clay sewer brick. ANON. *Proc. A. S. T. M.*, **21,** 527–32(1921).—These specifications cover four classes of clay bricks intended to be used in drainage structures for the conveyance of sewage, industrial waste and storm water, as follows, the purposes for which they are intended to be especially suitable being indicated:

Class A Vitrified Brick, for the interior of structures where resist. to the abrasive action of velocities up to 18 ft. per sec. is required.

Class B Vitrified Brick, for the interior of structures where resist. to the abrasive action of velocities up to 12 ft. per sec. is required.

Hard Brick, for structures requiring imperviousness to internal and external pressures and resist. to the abrasive action of velocities up to 8 ft. per sec.

Medium Brick, for storm water conduits, where a high degree of imperviousness is not required and where abrasive action is due to low velocities only.

For definitions of the above classes, see Table I.

TABLE I.—PHYSICAL TEST REQUIREMENTS FOR DIFFERENT CLASSES OF BRICK

	ABSORPTION LIMITS, PER CENT		COMPRESSIVE STR. (ON EDGE), LB. PER SQ. IN.		MODULUS OF RUPTURE, LB. PER SQ. IN.	
Glass	Mean of 5 tests	Individual maximum	Mean of 5 tests	Individual minimum	Mean of 5 tests	Individual minimum
Class A Vitrified	3 or less		5000 or over		1200 or over	
Class B Vitrified	5 or less	6.0	5000 or over	4000	1200 or over	800
Hard	5 to 10	12.0	3500 or over	2500	600 or over	400
Medium	10 to 15	17.0	2000 or over	1500	450 or over	300

Bases for purchase and acceptance are established. Nature of *raw materials*, *standard sizes*, and *methods of sampling* are specified. Provision is made for the following tests, details of which are described: *Chem. examn.; absorption*, *compressions* and *transverse tests; visual inspection.* ED.

131. Report of Committe C-4 on clay and sewer pipe. R. HERING, G. T. HAMMOND AND A. J. PROVOST, JR. *Proc. A. S. T. M.*, **21,** 285(1921).—No revisions were made in specifications. Sub-committees are now considering the following subjects: Absorption and hydrostatic pressure test requirements; chem. requirements; dimensions and their permissible variations; methods of testing; nomenclature and definitions. E. N. BUNTING

132. Report of Committee C-6 on drain tile. ANSON MARSTON AND J. T. STEWART. *Proc. A. S. T. M.*, **21,** 286–88(1921).—The tentative specif. for drain tile on p. 817 of the 1920 Proceedings have been recommended for adop-

tion as standard. The vital importance of thorough underdrainage in connection with all types of roads is just beginning to be realized and the hundreds of thousands of miles of tile required will be subjected to the standard tests. The main research investigation being carried on at present is the best development of chem. tests and chem. test requirements for drain tile to det. their resist. to the action of soil acids and alkalies. This research is being carried on at 5 different laboratories and will require at least 2 years to develop standard specifications. E. N. BUNTING

133. Report of Committee C-10 on hollow building tile. WALTER A. HULL AND CHAS. C. CROCKATT. *Proc. A. S. T. M.*, **21**, 324–25(1921).—As it has been found that the absorption test does not satisfactorily differentiate between acceptable and unacceptable tiles, the test has been omitted from the latest tentative specif. It is also recommended that the test specimens be taken from unbroken tile, as it has been found that while unbroken specimens may resist freezing satisfactorily, fragments from similar pieces do not. The Hollow Building Tile Association, in coöperation with the Bureau of Standards is carrying out an investigation of the physical properties of hollow building tile with special reference to their fire resist. and data already obtained has proved of great assistance to the Committee in the prepn. of the tentative specifications. E. N. BUNTING

134. Tentative specifications for clay hollow building tile. ANON. *Proc. A. S. T. M.*, **21**, 547–52(1921).—The specif. cover (1) Materials and manuf. (2) Physical props. and tests, including (*a*) compression test, freezing test, fire test; (*b*) selection of samples for test; (*c*) strength tests; (*d*) freezing test; (*e*) tolerances. (3) Standard sizes and dimensions. (4) Workmanship and finish. (5) Marking. (6) Inspection and rejection. E. N. BUNTING

135. Tentative definitions of terms relating to hollow tile. ANON. *Proc. A. S. T. M.*, **21**, 602–603(1921).—The definitions cover the following: I. Kinds of tile, as (1) hollow clay, (2) terra cotta, (3) hollow-building, (4) load-bearing: (*a*) floor, (*b*) foundation, (*c*) side construction, (*d*) end construction, (*f*) book, (*g*) vitrified, (*h*) salt-glazed; (5) hollow fire proofing, as (*a*) partition, (*b*) furring, (*c*) porous. II. Raw materials: (6) shale, (7) fire clay, (8) surface clay. III. Designation of dimensions, as (9) thickness, (10) width, (11) length. IV. Parts, openings, and surface features: (12) shells, (13) webs, (14) cells, (15) scoring. E. N. BUNTING

PATENT

136. Bricks. R. MILNER and T. ROBINSON. Brit. 163,569, April 13, 1920. Blast-furnace slag is ground and mixed with not more than 20% of clay and a sufficient quantity of ground C fuel to form a self-burning mixt., which is molded into the required shapes for bricks, etc., dried and then fired in kilns. A suitable mixt. is 70–85% slag, 5–20% clay, and 5–15% fuel.

Cement, Lime and Plaster

137. Bentonite. R. B. LADOO. Bureau of Mines Report. No. 2289, 5 pp. October, 1921. *Jour. Ind. Eng. Chem.*, **14**, 89(1922).—This rept. devotes

particular attention to the commercial utilization of bentonite in the manuf. of paper, soap, *gypsum* and *lime plasters*, adhesive paste, and as a water softener and dewatering agent for crude petroleum. ED.

138. "Mazout" (burning oil) as fuel for lime kilns. A. STOLL. *Rev. Mat. Constr. Trav. Pub.*, **146**, 216–17(1921).—Sketches of kiln and burner to take place of those given with article on the same subject in **142**, 129–30 (1921). Cf. *Jour. Amer. Ceram. Soc.*, **4**, 873.

139. Artificial cement by the "two fire" practice. C. DIDIER. *Rev. Mat. Constr. Trav. Pub.*, **146**, 201–203(1921).—Limestone is first burned, then slaked, giving an impalpable powder. The powder can be screened, then mixed with the requisite amts. of clay and water, pressed into brick, and then burned either in a vertical or a rotary kiln. D. favors the vertical kiln for the reason that higher temps. can be more readily and less expensively obtained than in the rotary kiln. LOUIS NAVIAS

140. Acid proof cements. DR. KLEINLOGEL. *Tonind. Ztg.*, **55**, 460(1921).—Described expts. with cements resisting the attack of acids and water. WM. M. CLARK

141. The English cement standards. ANON. *Tonind. Ztg.*, **51**, 423, 424(1921).—The specifications surrounding the pull test and Vicat needle indentation test on specimens of cement are described. WM. M. CLARK

142. Superior cements. H. KÜHL. *Tonind. Ztg.*, **49**, 406, 407(1921).—Consideration of improved quality and limitations governing the factors entering into same. WM. M. CLARK

143. Testing of plastic calcined magnesite for use in oxychloride cements. MAX Y. SEATON. *Proc. A. S. T. M.*, **21**, 1039–49(1921).—A short discussion of the general properties of oxychloride cements is followed by the physical tests for such cements including strength tests, setting time, vol. change, and permanence. The factors influencing the properties of these cements are given, *viz.*, the consistency of the mortar, the strength of the $MgCl_2$ soln., the character of the aggregate, storage conditions, and the quality of the calcined magnesite used. There is a wide discrepancy between the chem. anal. and physical tests, due to the fact that the time-temp. history of the calcining procedure is of vital influence on the reaction between MgO and $MgCl_2$. Suggested specif. are given. E. N. BUNTING

144. Report of Committee C-9 on concrete aggregates. S. E. THOMPSON AND A. T. GOLDBECK. *Proc. A. S. T. M.*, **21**, 317–21(1921).—Several tentative standards have been presented for adoption. Grading and impurities have become more and more prime factors in dealing with materials for concrete. An outline of various tests and researches is given, the lines of research in which the committee are engaged being (1) Laws of mech. mixts. of cement and aggregate; (2) Further researches on impurities; (3) Investigations of coarse aggregates to det. their relative value for concrete and mixts.; (4) The best type of specimen for mortar test; (5) The distribution of aggregate materials throughout the country; (6) Specif. for concrete; (7) Testing of field concrete after it is in place. E. N. BUNTING

145. Tentative specifications for concrete aggregates. ANON. *Proc. A. S. T. M.*, **21,** 544–46(1921).—Under fine aggregate are the definition; grading; strength in concrete; mortar strength; colorimeter test; concrete tests. Under coarse aggregate are the definition and the grading.
E. N. BUNTING

146. Report of Committee C-7 on lime. H. C. BERRY AND L. H. HART. *Proc. A. S. T. M.*, **21,** 289–93(1921).—A large amt. of research work has been done by the members of the committee on the prepn. of specif. for lime. It is requested that the present standard specif. for quicklime and hydrated lime be withdrawn and the revised specif. be adopted as tentative. A series of panel tests of lime plaster is under way and extensive research into the quality of sand suitable for use with lime as a plaster is being conducted. Revised methods of anal. have been recommended for tentative acceptance. Methods of detg. "available lime" and the d. of bulk lime have been developed and will be submitted at a later date. The plasticimeter designed by the Bureau of Standards has been adopted as a plasticity measuring instrument. It has been detd. that the plasticity of finishing hydrate is dependent upon its colloidal content. A very important advance has been made in the development of a set of directions for slaking lime and for the prepn. of mortar from putty. E. N. BUNTING

147. Coöperative tests on the effect of hydrated lime on concrete mixtures. ANON *Proc. A. S. T. M.*, **21,** 294–301(1921).—Test results from 5 laboratories, principally on wear and compression are given on the effect of small additions of hydrated lime to concrete mixts. used in roadwork. From the large no. of tests made it appears that the addition up to 15% of lime has little effect upon the compression strengths, but variable values are obtained, dependent upon the sand and the different kinds of fine aggregate used, ranging from 90% to 110% of the strength without the addition of lime. Addition of lime increases the wear from 5 to 50%. In the discussion Mr. D. A. Abrams gives a large number of tests which confirm in general the above results. E. N. BUNTING

148. Tentative specifications for quicklime for standard purposes. ANON. *Proc. A. S. T. M.*, **21,** 533–36(1921).—The specif. cover the following: definition; general quality; classes and sizes; basis of purchase; sampling; chem. properties and tests; physical properties and tests; inspection and rejection; method of test for percentage of waste. An appendix gives directions for slaking and for prepn. of putty for use. E. N. BUNTING

149. Tentative specifications for hydrated lime for structural purposes. ANON. *Proc. A. S. T. M.*, **21,** 537–43(1921).—After giving the defn. for hydrated lime, specif. for mason's hydrate are given under uses; chem. properties and tests; physical properties and tests, such as fineness, constancy of vol. and tensile strength; packing and marking; inspection and rejection; methods of test for fineness, constancy of vol. and tensile strength. Under finishing hydrate are uses; properties and tests; marking; general require-

ments; plasticity, which is detd. with the Emley plasticimeter, a diagram of which is given. E. N. BUNTING

150. Tentative methods of chemical analysis of limestone, lime and hydrated lime. ANON. *Proc. A. S. T. M.*, **21,** 565–76(1921).—After giving directions for the treatment of the sample, methods are given for the detn. of SiO_2, Fe_2O_3, Al_2O_3, CaO, SrO_2, MgO, ignition loss, mech. moisture, CO_2, SO_3, total S, P, MnO, and FeO. Over a page of notes are included. E. N. BUNTING

151. Report of Committee C-11 on gypsum. WARREN E. EMLEY AND V. G. MARANI. *Proc. A. S. T. M.*, **21,** 326–28(1921).—Revisions made in the tentative specif. are listed. (Specif. are abstracted below.) E. N. BUNTING

152. Tentative specifications for gypsum. ANON. *Proc. A. S. T. M.* **21,** 553–55(1921).—The specif. cover (1) materials and standards, (2) sampling, (3) packing and marking, (4) inspection and rejection. E. N. BUNTING

153. Tentative specifications for calcined gypsum. ANON. *Proc. A. S. T. M.*, **21,** 556–58(1921).—The specif. include the same items as Abs. 152. E. N. BUNTING

154. Tentative specifications for gypsum plastering sand. ANON. *Proc. A. S. T. M.*, **21,** 559(1921).—The sand should be free from salt and from alkaline, organic and other deleterious substances and should be of the proper fineness. E. N. BUNTING

155. Tentative methods of testing gypsum and gypsum products. ANON. *Proc. A. S. T. M.*, **21,** 590–99(1921).—The methods cover, (1) detn. of free water in gypsum, (2) detn. of fineness, (3) chem. anal. of gypsum for combined H_2O, CO_2, SiO_2, and insol. material, Fe_2O_3 and Al_2O_3, CaO, MgO, SO_3 and NaCl. Notes on methods, (4) precautions for physical tests, (5) testing consistency of calcined gypsum, using a Southard viscosimeter, diagram of which is given, (6) water-carrying capacity, (7) detn. of dry bulk and (8) of wet bulk, (9) detn. of time of setting, (10) of tensile strength, (11) of compressive strength, and (12) of sand-carrying capacity of calcined gypsum. E. N. BUNTING

156. Tentative definitions of terms relating to the gypsum industry. ANON. *Proc. A. S. T. M.*, **21,** 600–601(1921).—The following terms are defined: acceleration, aggregate, binder, cement, consistency, Keene's cement, mortar, plaster, plasticity, retarder, stucco, wood fiber. E. N. BUNTING

157. The effect of some physical conditions on calcium sulfate cements. C. L. HADDON. *J. Soc. Chem. Ind.*, **40,** 122–3T(1921).—Brief description is given of setting of anhydrous $CaSO_4$ cement and discussion of expansion and contraction in setting. Measurements of expansion were made by Le-Chatelier's app. on a number of samples. Results of expts. show (1) the expansion was least when accelerating solns. were used, and greatest when retarders were used; (2) wet set plaster using 5% soln. of sulfate as accelerator, although reaching its max. strength within 24 hrs., yet continued to expand during crystn., (3) wetness has great effect on tensile strength and the degree of wetness affects expansion, (4) the expansion under normal conditions is

very small—about 0.1%—and ceases within 7 days. The effect of expansion on the tensile strength and the weakness of flooring plaster by wetness and also the effect of mineral oils are discussed briefly. It is suggested that the conditions for briquette breaking should be precisely as is done with Port. cement—leave the briquettes in the mold for 24 hrs., take them out and place them in H_2O and then break the wet briquettes after a week. C. N. WILEY (*C. A.*)

158. Crystallization processes and transformations in the hardening of Portland cement. F. SCHOTT. *Tonind. Ztg.*, **62,** 537(1921).—Description of chem. and crystn. changes observed. WM. M. CLARK

159. The dependence of the lime industry upon nature and science. A. D. LITTLE. *Chem. Met. Eng.*, **25,** 149–52(1921).—An address. The markets for lime developed as a result of scientific investigation. The technical problems of the industry are discussed. Phys. properties are often more important than chem. properties. Progress already attained in kiln design and the mechanical equipment for the transportation of materials must be followed by accurate chem. control of operations. W. H. BOYNTON (*C. A.*)

160. Gypsum. FRANK A. WILDER. *Mineral Ind.*, **29,** 340–8(1920).—1920 was a record year in all branches of the gypsum industry. Agricultural gypsum increased 270%. A. BUTTS (*C. A.*)

161. Lime in 1919. G. F. LOUGHLIN AND A. T. COONS. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part II, 405–18(preprint No. 31, published Oct. 6, 1921). E. H. (*C. A.*)

162. Cement. ROBERT W. LESLEY. *Mineral Ind.*, **29,** 74–87(1920).—A review of the cement industry in the U. S. and foreign countries, giving statistics and notes on technology. A. BUTTS (*C. A.*)

163. Cement in 1919. ERNEST F. BURCHARD. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part II, 387–404(preprint No. 30, published Sept. 21, 1921). E. H. (*C. A.*)

164. Interpreting the chemical analysis of Portland cement. J. W. WITT. *Eng. News-Record*, **87,** 650–2(1921).—The limitations of chem. analysis in testing Portland cement are discussed. The relative amts. of the several components can not be detd. directly, and indirect analysis involves so many sources of errors that the results are not dependable. Since the relation between the compn. and physical behavior of cement is not fully understood, physical tests are indispensable. J. C. W. (*C. A.*)

165. The destruction of cement and of concrete conduits and masonry for sewage canals, reservoirs and similar works, and suitable means of prevention. A. SPLITTGERBER. Mannheim. *Z. Wasserversorgung Abwasserkunde*, **7,** 46–8, 51–5, 63–5(1920).—Both cements and concretes are easily destroyed by various agents. These agents are classed according as they occur in (1) the ground underlying the works; (2) the liquid conducted or held; (3) the surrounding air and (4) the materials used as ingredients in the cement or concrete. In (1) and (2) are acids and acid salts, chiefly those giving an acid reaction with Congo red, methyl orange or rosolic acid, but occasionally those neutral to these indicators; any S compd., especially H_2S, sulfates,

sulfites, thiosulfates and sulfides; nitrates; H_2O contg. CO_2; Mg compds.; Na and K salts and saponifiable fats and oils. In (3) are chiefly H_2S and CO_2. In (4) are most frequently $CaSO_4$ and Mg compds. Together with these agents are incidental effects such as elec. energy and mechanical vibration. According to Endell the most injurious effects are from H_2O contg. sulfates of all kinds and humus waters from marshy soil. Upon the class and character of the injurious agent depend the possibility and method of protection. Cements and concretes resistant to the agents are classed as those (1) mixed without a flux; (2) with a preventive chem. compd. incorporated in the mixt.; (3) with an insol. org. compd. incorporated in the cement or concrete to prevent porosity and (4) with a superficial impregnation of a resistant substance to prevent microporosity. To (1) belong cements and concretes without a flux which reacts with the external injurious compd. Trass and puzzuolana are the commonest substances added to increase resistance in (2). (3) includes certain soaps, fats and oils incorporated in the mixt. (4) includes Mg, Si and Al fluorides, tars and asphalts. Compds. which are seldom concerned but which attack cements are $(NH_4)_2C_2O_4$, $C_3H_5(OH)_3$, sugar, NH_3 and Pb and Zn compds. Besides the agents mentioned, the mollusks, *Teredo navalis*, *Lithodomus* (*Lithophagus*) and *Pholas dactylus* destroy cements. The articles are replete with references to previous investigators but without the sources. S. asserts however that complete references in the literature will be furnished on application. C. C. DAVIS (*C. A.*)

PATENTS

166. Cements. E. WALLIN. Brit. 157,971, Jan. 10, 1921. A cement, particularly applicable for jointless floor coverings, comprizes MgO and Mg nitrate or salts, such as $Ca(NO_3)_2$ and $MgSO_4$, which will interact to produce Mg nitrate. The materials may be mixed in the dry state and moistened when required for use. (*C. A.*)

167. Cement. H. D. BAYLOR. Brit. 158,390, Nov. 8, 1919. See U. S. 1,323,952. (*C. A.*)

168. Burning lime. J. C. SCHAFFER. U. S. 1,377,367, May 10. A steam supply is provided by which steam may be introduced beneath the grate of the furnace which heats a lime-burning kiln, in order to humidify the heating action of the furnace and temper the combustion zone extending from the furnace into the kiln.

169. Producing lime. W. CROW and J. C. SCHAFFER. U. S. 1,377,401, May 10. Limestone is mixed with hydrated lime and the mixt. is gradually heated for effecting porous nodulization. The product thus formed is suitable for making mortar or wall coatings.

170. Coating cement with celluloid. F. C. RUPPEL. U. S. 1,379,837, May 31. A sheet of celluloid is attached to the surface of concrete tiles or other concrete bodies by an intermediate layer of fibrous fabric, *e. g.*, cheese cloth.

171. Oxychloride cement. G. M. FORMBY. U. S. 1,379,680, May 31. A mixt. of $Ca(OH)_2$ and $Mg(OH)_2$ is treated with HCl and the product thus

obtained is added to Portland or other cements in order to harden and strengthen them.

172. Waterproofing cement. L. M. KREGELIUS. U. S. 1,382,986, June 28. A waterproofing mixt. for use with cement is formed of slaked lime mixed with paraffin or similar H_2O-repellant wax-like material.

173. Fireproof and insulating cement mixture. E. R. STOWELL. U. S. 1,382,329, June 21. A fireproof and insulating material adapted for use in building construction is formed of cement, Na silicate, powdered pumice and wood particles.

174. Hydrating lime. H. W. CHARLTON. U. S. 1,381,106, June 14. A hydrate of lime contg. less than the usual amt. of H_2O of hydration is prepd. by digesting slaked lime with an excess of H_2O under a pressure of 225 to 270 lbs. per sq. in. and at a corresponding temp.

175. Potassium compounds from cement-kiln gases. H. V. WELCH. U. S. 1,382,037, June 21. Cement-kiln gases or the like are treated with H_2O in such a manner as to obtain a satd. soln., and the sludge thus obtained is then heated to render additional K compds. sol. and the soln. is sepd. from the residue for recovery or utilization of its values.

BOOK REVIEWS

American society for testing materials. Proceedings of the Twenty-Fourth Annual Meeting. Pp. 1197 + 285 figures + 6 plates. Published by the Society., 1315 Spruce St., Phila., Pa. Price: $10, paper.

Volume 21 of the Proceedings surpasses its predecessors in magnitude. The subject matter is classified under the headings (1) Committee Reports, (2) New and Revised Tentative Standards and (3) Technical Papers. Material of ceramic interest is found under each heading. Full abstracts of all such material will be found in the preceding pages of this number of *Ceramic Abstracts*. ED.

The manufacture of optical glass and of optical systems. Ordnance Department Document No. 2307. LIEUT.-COL. F. E. WRIGHT. Pp. v + 309 and 94 figs. Government Printing Office, Washington, D. C., 1921.

According to the author, Lieut.-Col. F. E. Wright, Ordnance Reserve Corps, "The present report seeks to outline, in a general way, some of the factors which we encountered in the manufacture of optical glass and of lenses and prisms for fire control and observation instruments for the Army and Navy. The lessons to be learned from our recent experiences along these lines are so obvious that comment is unnecessary. Such lessons are soon forgotten by the country at large. It is, however, essential, that a written record be made of the war-time development of certain of the manufacturing problems as they confronted us and were solved. The record may serve a useful purpose, and be of value in case of a future emergency."

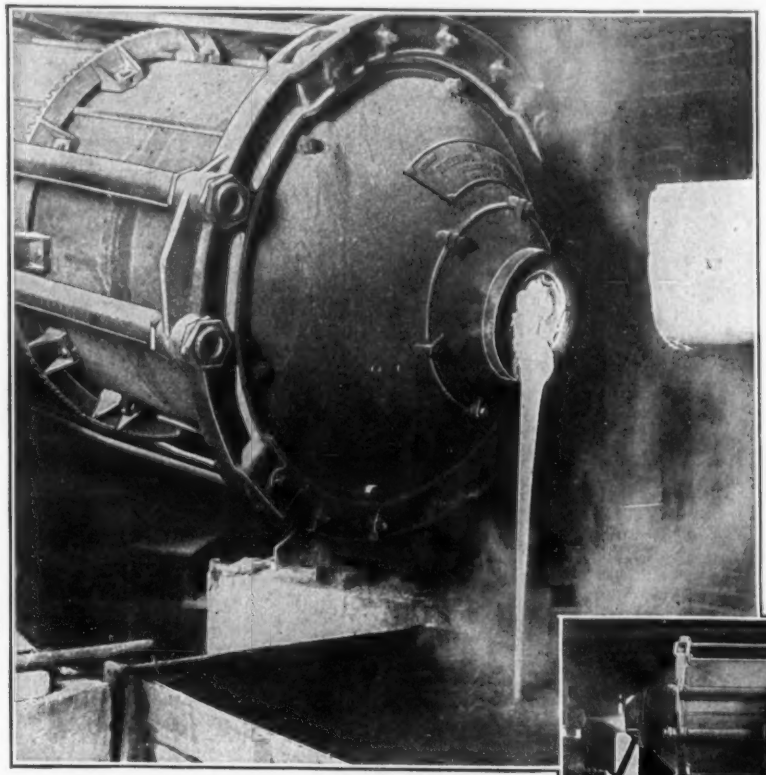
It is indeed gratifying that the record of a notable accomplishment, even though it has been well covered in journal articles, has been incorporated into

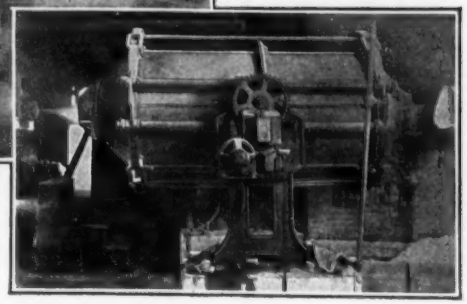
a single treatise and has been used in a permanent form. It is not only a treatise on the technology of the manufacture of optical glass and of optical systems but it is also a very readable story of the development in this country of the optical glass industry which was necessary to meet the war-time needs of the military forces and which, in a period of one and one-half years produced over 600,000 pounds of usable optical glass.

In presenting the several subjects, graphs, drawings and photographs are freely employed and particularly in the discussions of technology, numerous references are made to the literature. Accordingly this report will find a large use as a reference work and it is of particular interest to the entire glass industry by reason of the principles set forth under the discussion of the annealing of glass. The chapter titles are as follows:

I. Introduction.
II. The characteristics of optical glass.
III. The manufacture of optical glass.
IV. The inspection of optical glass.
V. The manufacture of lenses and prisms.
VI. The inspection of finished optical parts and systems.
VII. The optical instrument situation during the war.

This volume is bound in full canvas, lettered in gold and trimmed in red and black. The proof reading has been well done, the topography is excellent and a comprehensive index is included. E. W. T.





These illustrations made from photographs taken in the plant of Ingram-Richardson Mfg. Co., Beaver Falls, Pa.

12-21

"Our U. S. Enamel Furnaces Increase Output 25% per day at a Saving of 50% in Fuel Cost."

Ingram-Richardson Mfg. Company claim those remarkable results for their U. S. Enamel Furnaces. With four U. S. Furnaces operating at their plants at Frankfort, Indiana, and Beaver Falls, Pa., they are saving thousands of dollars yearly in fuel and labor.

Their white and colored enamels are smelted in quick time, with low loss. The work is easy and sure. The Furnace is under perfect scientific control. The melting process is visible. The Furnace rotates while melting and tilts when pouring. Linings last longer and cost less.

The U. S. Enamel Furnace is saving money over the old brick smelter in the Ingram-Richardson Mfg. Company plant. It will do the same for you.

Let the U. S. Furnace melt your enamel.

Write for specifications and prices on 60 lb., 150 lb., 400 lb., 750 lb., and 1200 lb. Enamel Furnaces. We will send photographs and list of users where furnaces are in operation.

THE
U. S. SMELTING FURNACE CO.
BELLEVILLE, ILLINOIS

Wonderful Savings in Drying

"Pittsburg"
TRADE MARK
QUOTATIONS SUBJECT TO CHANGE WITHOUT NOTICE

The Pittsburg High Voltage Insulator Co.

OFFICES AND FACTORY DERRY PA
LARGEST PORCELAIN INSULATOR FACTORY IN THE WORLD
CAPACITY 200,000 INSULATORS DAILY
DIRECT POSTAL TELEGRAPH WIRE IN OUR OFFICE

DERRY, PA. Nov. 2, 1921.

Proctor & Schwartz Inc.,
Seventh St. & Tabor Road,
Philadelphia, Pa.

Gentlemen:

The Proctor Automatic Four Track Tunnel Dryer which you installed in our plant has been operating satisfactory for about four months. We have not experienced any loss or waste of material whatever from the first day of operating up to this time.

We are able to dry all types of porcelain we are producing which includes pieces ranging in weight from eighty to one hundred and twenty pounds. The time required for drying ranges from forty-eight to sixty hours, while this same type of ware formerly required from thirteen to fourteen days.

It is really surprising what the dryer will actually do. For instance - It gives us a saving in floor space of between 35 and 45 %, in addition to cutting our loss from 12 and 15 % to 3 and 4 %.

We are very much pleased with the results obtained and should you at any time desire to have a prospective customer view the dryer in operation, we shall be very glad to arrange for a demonstration.

Yours very truly,

THE PITTSBURGH HIGH VOLTAGE INSULATOR CO.

H. V. Van Horn
Superinten...

HHVH/AM.

PROOF that it pays to install "Proctor" Drying Machinery for every Clay Product, is found in abundance.

"Proctor" Dryers in leading plants have radically reduced drying-time; saved labor, space and steam; increased the percentage of first-quality ware; cut costs—

Drying Electrical Porcelain, General Ware, Sanitary Ware, Saggers, Refractories and all other articles made from Clay.

Decide now on this self-paying improvement for your plant.

"Proctor" DRYERS
The best dryers in the world for Ceramic Ware

PROCTOR & SCHWARTZ, INC.

Pittsburgh
Chicago

PHILADELPHIA, PA.

New York
Providence

BUYERS' GUIDE

Alumina (Hydrate and Calcined)
Pennsylvania Salt Mfg. Co.

Auger Machines
Chambers Brothers Co.
Crossley Machine Co.
Manufacturers Equipment Co.

Automatic Cutters
Chambers Brothers Co.

Automatic Stove Rooms
Philadelphia Drying Mch. Co.

Ball Mills
Abbé Engineering Co.
Crossley Machine Co.
Hardinge Co.
Mueller Machine Co., Inc.

Bituminous Coal
Seaboard Fuel Corp.

Blowers (Pressure)
Abbé Engineering Co.

Boilers
Nashville Industrial Corp.

Bolting Cloth
Abbé Engineering Co.

Brick Making Machinery
Chambers Brothers Co.

Business Education
Alexander Hamilton Institute

Caustic Soda
Pennsylvania Salt Mfg. Co.

Ceramic Plant Equipment
Abbé Engineering Co.
Chambers Brothers Co.
Crossley Machine Co.
Manufacturers Equipment Co.
Mueller Machine Co., Inc.
Philadelphia Drying Machinery Co.
Proctor and Schwartz, Inc.

Ceramic Chemicals
Drakenfeld Co., B. F.
Harshaw, Fuller and Goodwin Co.
Paper Makers Importing Co., (Inc.)
Roessler and Hasslacher Chemical Co.
Vitro Mfg. Co.

Clay (Ball)
Johnson Porter Clay Co.

Clays (China)
Edgar Brothers Co.
Drakenfeld and Co., B. F.
Paper Makers Importing Co., (Inc.)
Roessler & Hasslacher Chemical Co.

Clay (Electrical —Porcelain)
Edgar Brothers Co.
Johnson Porter Clay Co.
Paper Makers Importing Co., (Inc.)

Clays (Enamel)
Edgar Brothers Co.
Johnson-Porter Clay Co.

Clay (Fire)
Edgar Brothers Co.
Paper Makers Importing Co., (Inc.)

Clay (Potters)
Johnson-Porter Clay Co.

Clay (Sagger)
Edgar Brothers Co.
Johnson Porter Clay Co.
Paper Makers Importing Co., (Inc.)

Clay Handling Machinery
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Manufacturers Equipment Co.
Mueller Machine Co., Inc.

Clay Miners
Edgar Brothers Co.
Johnson Porter Clay Co.

Clay Washing Machinery
Crossley Machine Co.
Mueller Machine Co., Inc.

Clay Working Machinery
Abbé Engineering Co.
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Manufacturers Equipment Co.
Mueller Machine Co., Inc.

Coal-(Bituminous)—
Seaboard Fuel Corp.

Colors
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.
Vitro Mfg. Co.

Conditioning Machinery
Philadelphia Drying Machinery Co.

Conical Mills
Hardinge Co.

Conveyors (Clay, Sand, Brick, etc.)
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Philadelphia Drying Machinery Co.
Manufacturers Equipment Co.
Mueller Machine Co., Inc.

Controllers (Automatic Temperatures)
Charles Engelhard, Inc.

Crushers
Abbé Engineering Co.
Chambers Brothers Co.
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Hardinge Co.
Manufacturers Equipment Co.
Mueller Machine Co., Inc.

Decorating Supplies
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.
Vitro Mfg. Co.

Disintegrators
Abbé Engineering Co.
Chambers Brothers Co.
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Manufacturers Equipment Co.
Mueller Machine Co., Inc.

Doors (Kiln-Dryer)
Manufacturers Equipment Co.

Dryers (China Ware—Porcelain)
Philadelphia Drying Machinery Co.
Proctor and Schwartz, Inc.
Russell Engineering Co.

Dryers (Radiated Heat)
Manufacturers Equipment Co.

Drying Machinery
Crossley Machine Co.
Philadelphia Drying Machinery Co.
Proctor and Schwartz, Inc.
Manufacturers Equipment Co.

Electrical Instruments
Charles Engelhard
Wilson-Maeulen Co.

Electrical Porcelain Machinery
Crossley Machine Co.
Mueller Machine Co., Inc.

Enameling Equipment, Complete
The Porcelain Enamel & Mfg. Co

Enameling Furnaces
George J. Hagan Co.
The Porcelain Enamel & Mfg. Co.
U. S. Smelting Furnace Co.

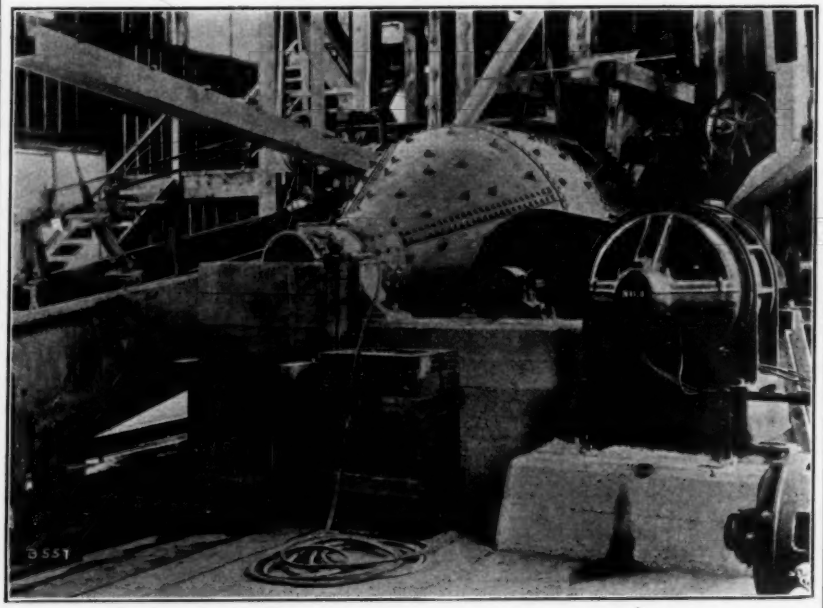
Enameling Muffles
George J. Hagan Co.
Parker-Russell Mining & Mfg. Co.

Enameling, Practical Service
The Porcelain Enamel & Mfg. Co.

Enamels, Porcelain
The Porcelain Enamel & Mfg. Co.

Engineering Service
Abbé Engineering Co.
Crossley Machine Co.
Chambers Brothers Co.
Hadfield-Penfield Steel Co.
Manufacturers Equipment Co.

Equipment (used)
Nashville Industrial



A Record Saving
In Fine Grinding Costs

One company formerly grinding silica to a fineness of 200 mesh required 240 H. P. to obtain this product.

One Hardinge Mill was installed to do the same work and accomplished even better results for a total of only 56 H. P., at the same time reducing the labor requirement by 12 men.

Another company hearing of this remarkable achievement also installed Hardinge. They too made an impressive saving.

There are many others who can do likewise. How about your case?

HARDINGE COMPANY
120 Broadway, New York, N. Y.

Hardinge Conical Mills

BUYERS' GUIDE (continued)

Mueller Machine Co., Inc.
Philadelphia Drying Machinery Co.
Proctor and Schwartz, Inc.
Russell Engineering Co.

Engines
Nashville Industrial Corp.

Extruding Machines (Lab. Use)
Chambers Brothers Co.

Feldspar
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
O'Brien and Fowler
Penland Feldspar & Kaolin Co.
Pennsylvania Pulverizing Co.
Roessler & Hasslacher Chemical Co.

Filtering Machinery
Abbé Engineering Co.
Crossley Machine Co.
Mueller Machine Co., Inc.

Fire Brick
Parker-Russell Mining & Mfg. Co.

Fuel
Seaboard Fuel Corp.

Furnaces
U. S. Smelting Furnace Co.
Parker-Russell Mining & Mfg. Co.
The Porcelain Enamel & Mfg. Co.
The Surface Combustion Co.

Furnaces (Electric)
George J. Hagan Co.

Gold
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.

Glazes and Enamels
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.
Vitro Manufacturing Co.

Ilmenite
Buckman and Pritchard, Inc.

Impervite (Refractory and Hard Porcelain)
Charles Engelhard, Inc.

Iron (Enameling)
United Alloy Steel Corp.

Jar Mills
Abbé Engineering Co.

Jiggers
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Mueller Machine Co., Inc.

Kaolin
Edgar Plastic Kaolin Co.
Harshaw, Fuller and Goodwin Co.
Penland Feldspar & Kaolin Co.
Roessler & Hasslacher Chemical Co.

Kryolith
Pennsylvania Salt Mfg. Co.

Laboratory Equipment
Nashville Industrial Corp.

Laboratory Mills
Abbé Engineering Co.
Crossley Machine Co.

Metals (Porcelain Enameling)
United Alloy Steel Corp.

Mills (*See under Ball Mills*)
(*See under Pebble Mills*)

Minerals
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.

Mixing Machines
Chambers Brothers Co.

Muriatic Acid
Harshaw, Fuller and Goodwin Co.
Pennsylvania Salt Mfg. Co.
Roessler and Hasslacher Chemical Co.

Oil (Die)
Best Oil Works

Oil (Lubricating)
Best Oil Works)

Oil (Sagger)
Best Oil Works

Operators (Coal)
Seaboard Fuel Corp

Oxides
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Paper Makers Importing Co., (Inc.)
Pennsylvania Salt Mfg. Co.
Roessler and Hasslacher Chemical Co.

Pans (Wet and Dry)
Chambers Brothers Co.
Crossley Machine Co
Hadfield-Penfield Steel Co
Manufacturers Equipment Co.
Mueller Machine Co., Inc.

Pebble Mills
Abbé Engineering Co.
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Hardinge Co.
Mueller Machine Co., Inc.

Plate Feeders
Chambers Brothers Co.
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Manufacturers Equipment Co.

Porcelain Balls and Lining
Abbé Engineering Co.

Porcelain Enameling Plants and Equipment
The Porcelain Enamel & Mfg. Co.

Porcelain Enameling Service, Practical
The Porcelain Enamel & Mfg. Co.

Porcelain Enamels
The Porcelain Enamel & Mfg. Co.

Pottery Machinery
Abbé Engineering Co.
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Manufacturers Equipment Co.
Mueller Machine Co., Inc.

Producer Gas Burning Systems
Manufacturers Equipment Co.

Pug Mills
Chambers Brothers Co.
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Manufacturers Equipment Co.

Pulverizing Machinery
Abbé Engineering Co.
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Hardinge Co.
Manufacturers Equipment Co.
Mueller Machine Co., Inc.

Pulverizing Mills
Abbe Engineering Co.
Crossley Machine Co.
Hadfield-Penfield Steel Co.
Hardinge Co.
Mueller Machine Co., Inc.

Pumps
Abbé Engineering Co.
Mueller Machine Co., Inc.

Pyrometers (Indicating)
Charles Engelhard, Inc.
Wilson-Maeulen Co.

Pyrometers (Recording)
Charles Engelhard, Inc.
Wilson-Maeulen Co.

Pyrometer Tubes (Refractory and Hard Porcelain)
Charles Engelhard, Inc.
Montgomery Porcelain Products Co.

Quartz
Penland Feldspar & Kaolin Co.

Recording Instruments
Charles Engelhard, Inc.

Refractory Materials
Buckman and Pritchard, Inc.
Parker-Russell Mining & Mfg. Co.

Regulators (Automatic Temperatures)
Charles Engelhard, Inc.

Rutile
Buckman and Pritchard, Inc.

Sagger Presses
Chambers Brothers Co.
Crossley Machine Co
Hadfield-Penfield Steel Co
Mueller Machine Co., Inc.

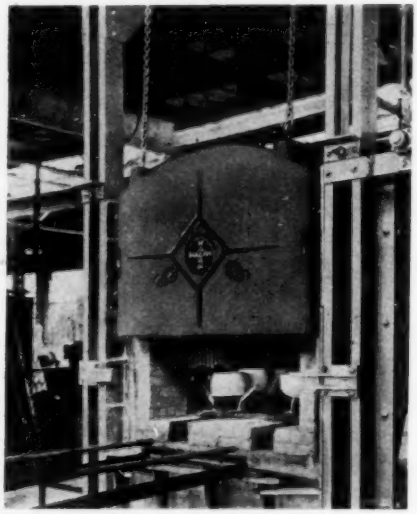
Selenite of Sodium
Drakenfeld and Co., B. F.
Vitro Mfg. Co.

Shippers (Coal)
Seaboard Fuel Corp.

Silica Brick
Parker-Russell Mining & Mfg. Co.

Silex Lining
Abbé Engineering Co
Hardinge Co.

Hagan Electric Furnaces for vitreous enameling



Hagan Electric Furnaces are today burning enamel on sheet-brass, sheet-steel, and cast-iron parts, better and faster than has ever before been possible.

ASK FOR BULLETIN E. F. 8.

GEORGE J. HAGAN COMPANY

COMBUSTION ENGINEERS FURNACE BUILDERS

PEOPLES BANK BUILDING, PITTSBURGH, PA.

515 MURPHY BLDG. DETROIT

20 EAST JACKSON BLVD. CHICAGO

52 VANDERBILT AVE. NEW YORK

BUYERS' GUIDE (continued)

Smelters
Parker-Russell Mining & Mfg. Co.
U. S. Smelting Furnace Co.
The Surface Combustion Co.

Sulphuric Acid
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Pennsylvania Salt Mfg. Co
Roessler and Hasslacher Chemical Co.

Temperature Instruments (Measuring)
Charles Engelhard, Inc.

Thermometers (Electric Resistance)
Charles Engelhard
Wilson-Maeulen Co.

Tile Machinery (Floor and Wall)
Crossley Machine Co.
Mueller Machine Co., Inc.

Tubes (Insulating)
Montgomery Porcelain Products Co.

Tubes (Pyrometer)
Charles Engelhard, Inc.
Montgomery Porcelain Products Co.

Tube Mills
Abbé Engineering Co.

Tunnel Kilns
Russell Engineering Co.

Vacuum Pumps
Abbé Engineering Co

Whiting
Drakenfeld and Co., B. F.
Harshaw, Fuller and Goodwin Co.
Roessler and Hasslacher Chemical Co.

Zircon (Miners of)
Buckman and Pritchard, Inc.

Zirconia
Vitro Mfg. Co.

Zirconium Silicate (Fire Cement)
Buckman and Pritchard, Inc.

Zirconium Silicate (Refined)
Buckman and Pritchard, Inc.

ALPHABETICAL LIST TO ADVERTISERS

	PAGE
Abbé Engineering Co.	Outside back cover
Alexander Hamilton Institute	19
Best Oil Works	18
Buckman and Pritchard, Inc.	13
Chambers Brothers Co.	18
Crossley Machine Co.	10
Drakenfeld and Co., B. F.	12
Dominion Feldspar Corporation	15
Edgar Brothers Co.	18
Engelhard, Charles Inc.	16
Hadfield-Penfield Steel Co.	15
Hagan, George J. Co.	8
Hardinge Co.	6
Harshaw, Fuller and Goodwin Co.	2
Journal of the Society of Glass Technology	18
Johnson-Porter Clay Co.	14
Manufacturers Equipment Co.	17
Montgomery Porcelain Products Co.	10
Mueller Machine Co.	22
O'Brien and Fowler	14
Paper Makers Importing Co., (Inc.)	17
Parker-Russell Mining & Mfg. Co.	11
Penland Feldspar & Kaolin Co.	16
Pennsylvania Pulverizing Co.	15
Pennsylvania Salt Mfg. Co.	22
Philadelphia Drying Machinery Co.	1
Porcelain Enamel & Mfg. Co.,	Inside back cover
Proctor and Schwartz, Inc.	4
Roessler and Hasslacher Chemical Co.	Inside front cover
Russell Engineering Co.	20
Seaboard Fuel Corporation	21
Surface Combustion Co.	14
United Alloy Steel Corporation	10
U. S. Smelting Furnace Co.	3
Vitro Manufacturing Co.	20
Wilson-Maeulen Co., Inc.	11

If you want pyrometer protection tube satisfaction
USE

Montgomery Hard Porcelain Pyrometer Tubes

All Sizes and Lengths for either Platinum or Base Metal Couples

The Best Liked and Most Largely Used Protection Tubes on the Market today

If the manufacturer of your pyrometer equipment cannot supply you, write us direct.

TRADE MARK

MONTGOMERY PORCELAIN PRODUCTS CO.
FRANKLIN, OHIO, U. S. A. 10-22

For Fine Porcelain Enamel

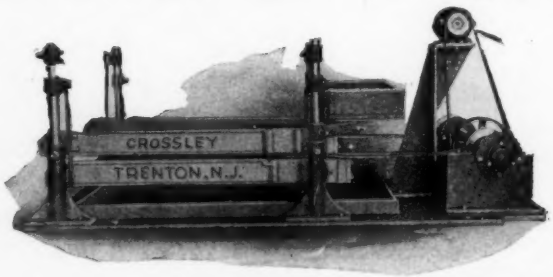
Toncan Metal used as a base for porcelain enameling insures a lasting, brilliant finish, free from blemish. Economical because it reduces waste. Ask for our book "Better Sheet Metal."

TONCAN METAL

The Iron that Endures and Insures

United Alloy Steel Corporation, Canton, Ohio.

The "Crossley" Ball Bearing Lawn



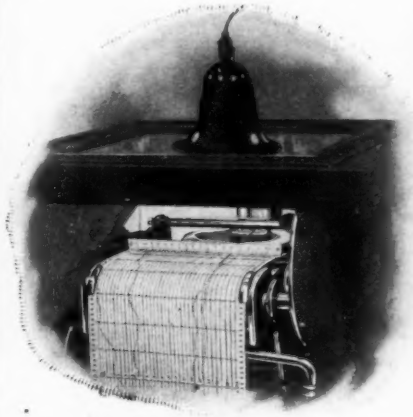
No bronze boxes, straps or keys to cause you any trouble. Something new, worth your consideration; it will save you money and annoyance.

Write us for full information

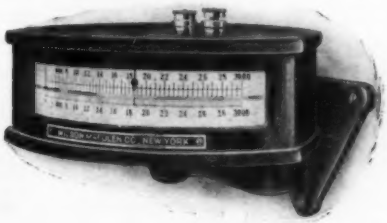
Crossley Machine Company

Trenton New Jersey

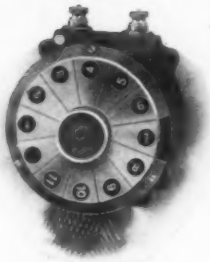
Clay Working Machinery Specialists



TAPALOG (Multi-Recorder)



The
TRUEST
Combination
of
Accuracy
Durability
Robustness
Convenience



PYROMETERS for Production or Research

Wilson-Maeulen Co., Inc. 386 Concord Ave., New York

5-22

COAL, COKE, GAS, OIL FIRED

ENAMELING MUFFLES
SMELTERS
INDUSTRIAL FURNACES

DESIGNERS AND BUILDERS
HIGH GRADE FIRE BRICK, SPECIAL TILE
SILICA BRICK AND TILE, ETC.

YOUR INQUIRIES WILL RECEIVE PROMPT ATTENTION

THE PARKER RUSSELL
MINING AND MANUFACTURING CO.
ST. LOUIS, MO. 603 LACLEDE GAS BUILDING

Established 1869

Antimony Oxide
Cadmium Sulphides
Chrome Oxides
Cobalt Oxides
Copper Oxides
Nickel Oxides
Powder Blue
Selenium Metal
Uranium Oxides

B. F. DRAKENFELD & CO., Inc.

IMPORTERS AND MANUFACTURERS OF

INDUSTRIAL CHEMICALS, OXIDES

Vitrifiable Colors and Materials

For Pottery, Glass, China and Enameling

PERFECTION KILNS

For Glass, China and Pottery

DECORATORS' SUPPLIES

Main Office: 50 MURRAY STREET, NEW YORK

BRANCHES:

CHICAGO, ILL. *EAST LIVERPOOL, O.*

WORKS:

WASHINGTON, PA. *WHEELING, W. VA.*

B. & P.

ZIRCON

("T" GRAIN)

Highest Zirconium Dioxide content.

Free from Iron and Titanium. Pure white.

We are the World's largest producers of Zircon and Titanium.

BUCKMAN & PRITCHARD, INC.

MINERS AND MANUFACTURERS

MINERAL CITY, FLORIDA

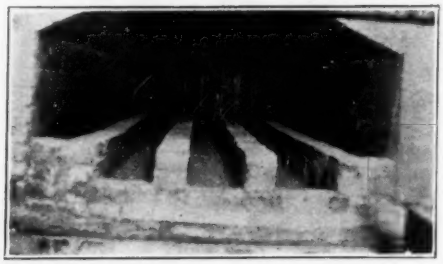
New York Office, *94 Fulton Street*

Chicago Office, *People's Gas Building*

VITREOUS ENAMELING FURNACES

Utilizing Clark patented principle of intermittent and direct firing
(The Surface Combustion Co.—Sole Licensee)

16 MONTHS WITHOUT REPAIRS
AND GOOD FOR SEVERAL YEARS MORE



Unretouched photograph of interior of Surface Combustion Enameling Furnace in operation 6 days per week for 16 months with no repairs whatever.

Write now for full details and engineering data.

Branch Offices:
Chicago
Philadelphia
Pittsburgh
Baltimore

THE SURFACE COMBUSTION CO.
Engineers & Manufacturers of Industrial Furnaces for all purposes

Main Offices and Works:
Gerard Ave. & 145th St.
Bronx, N. Y. C.

5-22

Highest Grade Domestic
BALL CLAYS PLASTIC SAGGER CLAYS WAD CLAYS
ENAMEL CLAYS SUPERIOR TO IMPORTED
THE JOHNSON-PORTER CLAY CO., McKenzie, Tenn.

You need the
Collective Index
to get the best result from your Transactions and Journal Send **$1.50** to
CHAS. F. BINNS, Alfred, N. Y.

FELDSPAR
PRODUCERS OF THE FAMOUS "DERRY" SPAR MINED at Buckingham, Quebec
O'BRIEN & FOWLER
(M. J. O'Brien Limited)
Bank of Nova Scotia Building
Wellington Street
OTTAWA CANADA

FELDSPAR

Canadian Feldspar is already recognized by the leading Potters, Tile Manufacturers, Enameling Works and Insulator Manufacturers, as being the only spar, the use of which will produce the finest finished product.

We therefore take pleasure in announcing to the trade generally that we are the sole agents in the United States for the

Famous "Derry" Spar

from the celebrated O'Brien and Fowler Mine at Buckingham, Quebec.

This spar is free from quartz, runs uniform as to quality, and the supply is assured for years to come.

To those desiring to improve their product and keep pace with their competitors this advertisement is specially recommended to notice, as our Mill capacity is rapidly reaching its limit on orders.

"DERRY" FELDSPAR will correct all your troubles.

Quality and uniformity guaranteed in every carload shipped.

Samples and analysis gladly submitted on request.

All correspondence to

THE DOMINION FELDSPAR CORPORATION

ROCHESTER, N. Y.

NOTE: Special attention given to grinding.

THE HADFIELD PENFIELD STEEL CO.

BUILT RIGHT RUN RIGHT

BUCYRUS OHIO

CLAY PLANT EQUIPMENT

We build every machine and appliance required for making various Clay Products. Correspondence solicited. We also build Rotary Driers, Cement Mchy., Fuel Oil Engines (Diesel Type), Gasoline Locomotives, Ship Deck Equipment, etc.

The Hadfield-Penfield Steel Co., Bucyrus, Ohio.

Formerly The American Clay Mchy. Co.

1-22

CANADIAN FELDSPAR

New York Feldspar Corp.
Rochester, N. Y.
"Buckingham" Feldspar

Pennsylvania Pulverizing Company
Lewistown, Pa.
Selling Company

Feldspar Mines Corp. Ltd.
Toronto, Canada
"Woodcox" Feldspar

Sales Office
341 Fourth Avenue,
Pittsburgh, Pa.

Miners of High Grade
Feldspar Kaolin Quartz

If you are in the market for superior grades, get in touch with us, we can satisfy you.

Penland Feldspar & Kaolin Co.

Penland North Carolina

CHEMICAL WARE & MACHINERY

From the Old Hickory Powder Plant. An immense amount of new and slightly used chemical stoneware, Duriron, laboratory equipment, technical machinery, boilers, engines, etc., now available for immediate delivery at extremely low prices. **Write for Bulletin No. 14.**

NASHVILLE INDUSTRIAL CORPORATION, Jacksonville, Tenn

A Word From The Membership Committee

Every man in the ceramic field owes it to himself and to the industry to be a member of the American Ceramic Society. Membership means influence and prestige for every man affiliated.

For full information—address

Frank H. Riddle, Chairman
Membership Committee

Jeffrey Dewitt Co.
Detroit, Mich.

ENGELHARD PYROMETERS

You will find them guarding quality and lowering production costs in every kind of ceramic industry. You will be especially likely to find them in plants where the temperature conditions are unusually severe and in many of these cases they represent the "survival of the fittest."

Good thermoelements, adequate protection tubes and frictionless instruments, as found in the Engelhard, mean accurate service and low maintenance.

Engelhard Pyrometers Are Good Pyrometers to Standardize on

Charles Engelhard, Inc.

30 Church Street, New York City

1892 ——— MEANS ——— 1922

THIRTY YEARS IN THE GRAND OLD SCHOOL OF EXPERIENCE

ENGLISH AND DOMESTIC

CLAYS
FOR
ALL
CERAMIC
PURPOSES

PMIC-Inc. MEANS—SERVICE, QUALITY AND PRICE

PAPER MAKERS IMPORTING CO., INC., EASTON, PA.

9-22

We Have Faith in Our Goods so We Advertise Here——

The Underwood Producer Gas System, patented, saves fuel and labor in burning clayware, baking carbon products, roasting ores, heating lehrs in glass factories, also revolving pots, etc., and enameling metal ware.

The Justice Radiated Heat and Waste Heat Dryers for drying structural clayware have no equal in economy and efficiency.

"Meco" Single Roll Rock and Shale Crushers, Elevators, conveyors, and feeders make up the most complete clay preparing outfit, a necessity in every clay plant when material must be ground and screened. Write us about these things. To answer is our pleasure.

THE MANUFACTURERS EQUIPMENT CO.

Dayton, Ohio, U. S. A.

9-22

Quality *Uniformity* *Experience*

Edgar QUALITY *Clays*

REALLY washed—Highest percentage clay substance

Brands	*Produced by*
Edgar Florida Kaolin	*Edgar Plastic Kaolin Co.*
Edgar Georgia Paper Clay and Kaolin	*Edgar Brothers Co.*
Lake County Florida Clay	*Lake County Clay Co.*

One Management—Office, Metuchen, N. J.

12-21

BRICK MAKING MACHINERY

OF THE STRONGER AND BETTER CLASS

We specialize on Dies and Augers and to their adaptation to individual requirements. Automatic Cutters up to 12000 bricks per hour Capacity.

CHAMBERS BROS. CO. Fifty-Second Street Corner of Media **Philadelphia, Pa.**

4-22

The Journal of the Society of Glass Technology

A quarterly Journal containing original papers and abstracts of papers covering the whole field of Glass Technology.

Annual Subscriptions to Society (including Journal)

Ordinary Members	$ 7.00
Collective Members	$15.00
Price per Number to non-Members	$2.50
Price per volume (unbound) to non-Members	$9.00

Forms of application for Membership may be obtained from the American Treasurer of the Society, Mr. Wm. M. Clark, Ph.B., Nela Park, Cleveland, Ohio.

Address orders and inquiries to: The Secretary Society of Glass Technology, The University, Sheffield, England

Best Oil Works

manufacturers of

BEST Die & Sagger **OIL**

Better and Cheaper Than Lard Oil

Send for Sample

Trenton

NEW JERSEY

The technical man who was thru at thirty

THIS happened in Michigan; but the place is unimportant. It might have happened anywhere; as a matter of fact it is happening everywhere; in your plant and in all the industries.

A young technical man entered the employ of a Michigan manufacturer, and moved along rapidly until he was head of a technical department.

The officers of the Company liked him. More than once he was discussed at the board meetings.

"There's exactly the type of man for Production Manager," it was said. "He's clear-headed, well-liked and of executive timber. Let's see what he knows and put it up to him."

But the young man never did become Production Manager; his career is one of those countless tragedies of industry. The officers who wanted to promote him found that they could not promote him.

He knew enough to manage a technical department, but for larger responsibilities he lacked knowledge and self-confidence and decision. He had never grown beyond his department managership.

He was thru at thirty.

And the other man who kept on growing

CONTRAST that man with another of the same age—a man who worked as a chemist for an Ohio industry. The office of General Manager became vacant, and the Company looked around for a man.

Chemical experience was a requisite; but the man must have more. He must know something of factory organization and control; of costs and accounting; of office management; of advertising, merchandising and corporation finance.

To their surprise they found that the young chemist knew all these things. His practical experience had given him technical proficiency; the Alexander Hamilton Institute had given him a grasp of the fundamentals which are found in every industry.

And now he is a stockholder in the Company, sharing its profits in addition to a salary four times greater than his former earnings.

"My business policy was shaped by your Course," he wrote to the Institute; and, he added "in the organization of our Company I owe my present stock holdings to the teachings I received in your course."

13,000 technical men who are going ahead

IN all the industrial world there are just two types of men. There is the man who goes only as far as experience in one technical department can carry him and settles down in a department position for life.

The other man takes a new hold upon himself in his twenties or thirties or earlier forties; he adds business training to experience and travels far.

For years the Alexander Hamilton Institute has been engaged in the splendid task of helping men to find themselves.

Its training means larger vision; more rapid progress, increased earning power. And the proof is this—thousands of men have tested their training in their own experience; and 13,000 of the thousands who have enrolled, were technical men.

The Advisory Council

ONLY a training vitally sound and practical could have the indorsement of such men as form the Advisory Council of the Alexander Hamilton Institute. This Council consists of: John Hays Hammond, the eminent engineer; Frank A. Vanderlip, the financier; General Coleman duPont, the well-known business executive; Jeremiah W. Jenks the statistician and economist; and Joseph French Johnson, Dean of the New York University School of Commerce.

Only you can decide where you will stop

EVERY man in business is paying for this Course whether he benefits by it or not. The Michigan man paid, and at a tragic price. He might have moved on up to larger success but he stopped at thirty.

Only you can decide where you will stop. A training which has done so much for thousands of other men is open to you also.

"Forging Ahead in Business"

FOR men who are asking themselves "where am I going to be in business ten years from now?" the Alexander Hamilton Institute publishes a 120-page book. It contains a full explanation of what the Modern Business Course and Service is and does. It will richly repay a careful reading, and it is sent without obligation; the coupon will bring it. Send the coupon now

ALEXANDER HAMILTON INSTITUTE

417 Astor Place, New York City

Send me "Forging Ahead in Business" which I may keep without obligation,

Name.....
Print here

Business
Address.....

.....

Business
Position.....

Canadian address, C.P.R. Building, Toronto; Australian Address, 42 Hunter St., Sydney

Copyright, 1922, Alexander Hamilton Institute

Russell
Tunnel Kiln
(ZWERMAN PATENT)

This company has no Tunnel Kiln Plans to sell. Therefore our responsibility does not end with the design. We furnish all the material and *we* construct the complete kiln. Then we stay on the job until economical and satisfactory production is assured.

Write for new booklet, "Modern Firing."

RUSSELL ENGINEERING COMPANY
Railway Exchange Bldg., St. Louis, Mo.

E-543

ZIRCONIA

Natural Dioxide
powdered——granulated
White Refined Dioxide
free from iron

ENAMELS IN ALL COLORS

for Cast Iron
Coloring Oxides

THE VITRO MFG. CO. TRADE MARK PITTSBURG, PA.

and for Steel
Vitro White

Announcing

that the

Seaboard Fuel Corporation

1610 Spruce Street

Philadelphia **Penna.**

furnishes

High Grade

Bituminous Coal

Especially Adapted

for

Pottery **Kiln Firing**

LOW **ASH**
VOLATILE
SULPUHR

Consult our Engineering Department
for your Kiln Firing
Problems.

SOLE IMPORTERS OF

KRYOLITH

GENUINE
GREENLAND
FOR THE GLASS AND
ENAMEL TRADES

MANUFACTURERS OF

NATRONA
HYDRATE and OXIDE
FOR THE GLASS, ENAMEL
AND PORCELAIN TRADES

ALUMINA

And Other INDUSTRIAL CHEMICALS

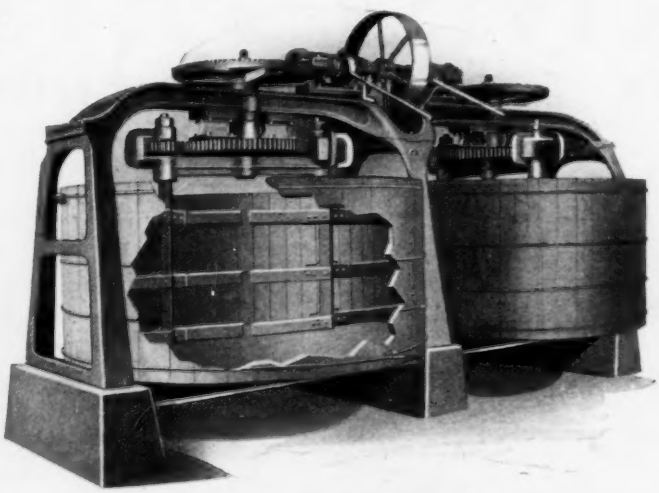
Pennsylvania Salt Manufacturing Co.

MAIN OFFICES:
PHILADELPHIA

615 UNION ARCADE BLDG.
PITTSBURGH, PA.

1-22

"MUELLER" Blunger



Get acquainted with our modern and efficient sliphouse equipment.

Write for Catalogue.

MUELLER MACHINE COMPANY, INC.
Trenton, N. J.

PEMCO

Porcelain Enameling Service

EQUIPMENT

The PEMCO Organization will design your Porcelain Enameling Plant and furnish only such equipment as do business—a complete and efficient Enameling Department at a fixed price.

ENAMELS

PEMCO will furnish your Porcelain Enamels for your particular purpose. PEMCO Enamels are admitted superior to any other make. PEMCO Enamels are dependable and run absolutely uniform. PEMCO Enamels sink into and fuse with the base metal. All colors finish in a brilliant high gloss. PEMCO is the Largest Producer of Vitreous Enamels.

SERVICE

PEMCO Service in Association with PEMCO Enamels is the feature which made the name "PEMCO" famous. PEMCO has the long experience which helps our friends to developed Porcelain Enameling economically right from the Start.

PEMCO puts your Plant in operation, shows you how to do the work right and maintains supervision over your Enameling Department to insure

"PEMCO IS RELIABLE"

The Porcelain Enamel & Manufacturing Co.

BALTIMORE, MD.

FINE PORCELAIN WARE

REQUIRES

FINE GRINDING

DO IT IN AN

ABBÉ

ENGINEERING CO.

BALL OR PEBBLE MILL

EQUIPPED WITH OUR PATENTED MANHOLE FRAME.

One 6 ft. Battery of 6' x 6' Ball Pebble Mills Installed in a Large Porcelain Plant

We also Manufacture

Jar Mills — Vacuum Pumps

Disintegrators — Rotary Compressors

ABBÉ ENGINEERING COMPANY

54 CHURCH ST.

NEW YORK